COMPUTERS AND AUTOMATION

CYBERNETICS • ROBOTS • AUTOMATIC CONTROL

ol. 3
o. 6

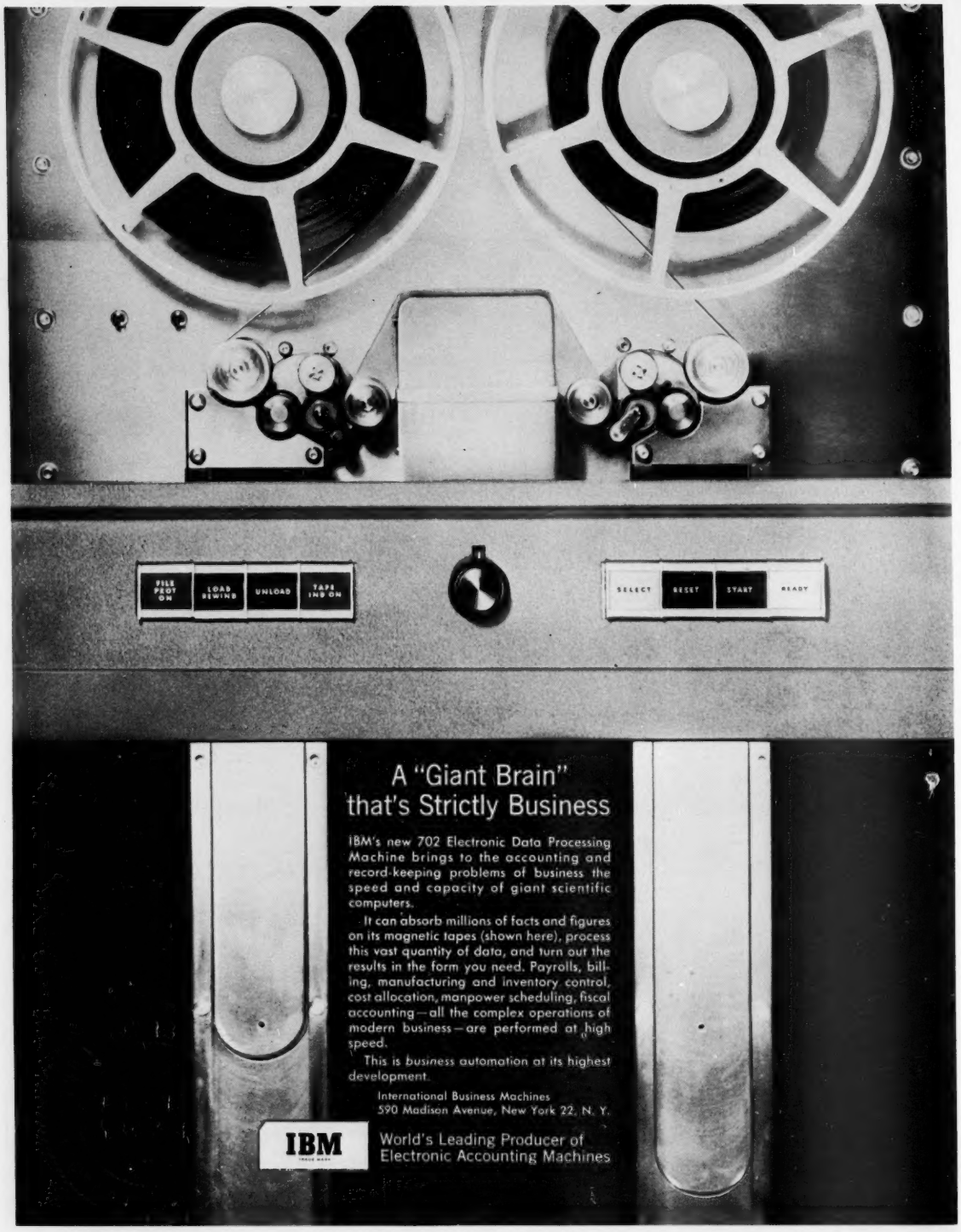
Human Factors in the Design of Electronic Computers
... John Bridgewater

What is a Computer?
... Neil Macdonald

Automation — List of Outstanding Examples
(cumulative)

Automatic Computers — List
(cumulative)

ULY
954


FILE PROT ON
LOAD REWIND
UNLOAD
TAPE IND ON
SELECT
RESET
START
READY
A "Giant Brain" that's Strictly Business
IBM's new 702 Electronic Data Processing Machine brings to the accounting and record-keeping problems of business the speed and capacity of giant scientific computers.
It can absorb millions of facts and figures on its magnetic tapes (shown here), process this vast quantity of data, and turn out the results in the form you need. Payrolls, billing, manufacturing and inventory control, cost allocation, manpower scheduling, fiscal accounting—all the complex operations of modern business—are performed at high speed.
This is business automation at its highest development.
International Business Machines
590 Madison Avenue, New York 22, N. Y.
IBM
World's Leading Producer of Electronic Accounting Machines

COMPUTERS AND AUTOMATION

CYBERNETICS • ROBOTS • AUTOMATIC CONTROL

Vol. 3, No. 6 July, 1954

ARTICLES Page

Human Factors in the Design of Electronic Computers ... John Bridgewater 6

What is a Computer? ... Neil Macdonald 14

REFERENCE INFORMATION

Roster of Organizations in the Field of Computers and Automation (supplement) 8

Automation — List of Outstanding Examples (cumulative) 13

Automatic Computers — List (cumulative) 18

Patents 31

Roster of Automatic Computing Services (supplement) 33

FORUM

The Electronic Juggler of Reeves Instrument Corp. 22
Glossary — Contributions 22
Help Wanted — Bill Danch 28
Employment Opportunity 33

The Editor's Notes 4

Advertising Index 38

Editor: Edmund C. Berkeley Advisory Committee: Samuel B. Williams, Herbert F. Mitchell, Jr.
Assisstant Editors: Eva Di Stefano, Neil Macdonald, Hans Schroeder, F.L. Walker
Contributing Editors: Alston S. Householder, Fletcher Pratt

Publisher: Edmund C. Berkeley and Associates
36 West 11 St., New York 11, N.Y. — ALgonquin 4-7675
815 Washington St., Newtonville 60, Mass. — DEcatur 2-5453 or 3928

COMPUTERS AND AUTOMATION is published ten times a year, monthly except June and August. Copyright, 1954, by Edmund Callis Berkeley. Subscription rates: $4.50 for one year, $8.50 for two years, in the United States; $5.00 for one year, $9.50 for two years, in Canada; $5.50 for one year, $10.50 for two years elsewhere. Advertising rates: see page 36. Entered as second class matter at the Post Office, New York, N.Y.

THE EDITOR'S NOTES

Meetings. The program of the "Conference on Training Personnel for the Computing Machine Field" at Wayne University, Detroit, Michigan, on June 22 and 23, contains 16 papers and talks, and 3 panel discussions. The subjects of the sessions include: manpower requirements in the computer field; educational programs; influence of automatic computers on technical and general education; and cooperative efforts for training and research. The conference proceedings will be published by the Wayne University Computation Laboratory.

The program of the 1954 general meeting of the Association for Computing Machinery on June 23, 24, and 25 in Ann Arbor, Michigan, lists 110 papers to be given. The abstracts of these papers have been stated in the program of the meeting. The subjects of the sessions include the following: business data handling; new machines for business applications; component developments in digital and analog computers; analog computer techniques; the computational needs of astrophysics; computer mathematics; digital computer programming; digital computer system development; punched card techniques; automatic programming; the operation of a digital computing center; digital computer logic; digital computer techniques; applications of digital and analog computers; real-time simulation by analog and digital means; numerical methods in partial differential equations; automatic computation in nuclear engineering; digital computer design. Many of the papers (probably not all) will be published in the "Journal of the Association for Computing Machinery" (address: 2 East 63 St., New York 21, N. Y.).

Up-To-Date Information. We express our thanks to the following persons who sent us more up-to-date and correct information: Mr. H.T. Avery, of Marchant Calculators, Inc; Mr. John Gruenberg, of Burroughs Research Center; Mr. Charles F. West, of Soroban Engineering, Inc.; and Mr. Kenneth J. Slee, *on behalf of Librascope*, Inc.

If anyone tells us corrections or changes (such as address changes, telephone numbers, changes in number of employees or types of products, etc.) by means of which we can make some information that we publish more complete and accurate, we shall be most grateful. If the change affects an entry in the "Roster of Organizations in the Field of Computers and Automation", we publish the revised entry in the next issue of the magazine.

Automation -- List of Outstanding Examples. Another piece of reference information has been started in this issue: a list of outstanding examples of automation. There may be many other examples which should be mentioned. We should be glad to hear about them.

Employment Opportunities. Any organization looking for personnel is invited to send us information, to which we plan to call attention. For example, Hughes Research and Development Laboratories is looking for personnel; see their ad in this issue.

The growth of this magazine is causing us to look for more personnel; anyone interested in doing work related to this magazine is invited to write us, stating his qualifications. The type of work to be done includes: editing; proofreading; promotion; selling advertising; writing; doing research; obtaining subscriptions; compiling information; etc. A good knowledge of computers and automation is desirable.

Printed Inserts. This is the second issue of the magazine of "Computers and Automation" to contain printed inserts; and this time two new problems were raised. One was fastening them in (solution: side-stitching this issue instead of saddle-stitching as usual). The second was insufficient supply (1100) of inserts from one advertiser to cover the whole printing (1800); as a solution, we offered him some supplementary advertising space in the photooffset part of the magazine, and this he has used.

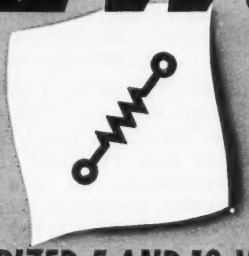
Technical Papers. So far we have not published technical papers (papers with mathematics, circuits, specification of constructional components, etc.) in "Computers and Automation". Would any reader like us to change this policy, and print such papers?

Address Changes. If your address changes, please notify us giving both old and new addresses, and allow three weeks for the change.

Back Copies. See the information on page 34.

Manuscripts. We desire to publish articles that are factual, useful, understandable, and interesting to many kinds of people engaged in one part or another of the field of computers and automation. See the information on page 28.

NEW!



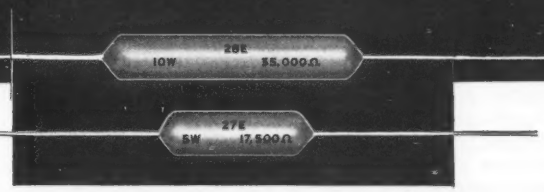
NEW!

for convenient point-to-point wiring . . .

MINIATURIZED 5 AND 10 WATT WIRE-WOUND RESISTORS!

AXIAL LEAD Blue Jackets®

PHOTOGRAPHS ACTUAL SIZE ▶



Here are two *truly miniaturized* self-mounting wire-wound power resistors to simplify your TV and industrial electronic production where space is a factor. They're ideal for point-to-point wiring, terminal board mounting, and processed wiring boards, where they fit in admirably in dip-soldered subassemblies.

Axial lead Blue Jackets are rugged vitreous enamel power resistors built to withstand the severest humidity performance requirements As for *economy*, these newest members of the Sprague Blue Jacket family are low in cost . . . eliminate need for extra hardware . . . save time and labor in mounting!

You can get these outstanding new Blue Jacket Resistors without delay in any quantity you require. Sprague Engineering Bulletin 111 gives full data on these and all other commercial Blue Jacket Resistors. Send for your copy.

SPRAGUE ELECTRIC COMPANY
100 Marshall Street, North Adams, Mass.

SPRAGUE TYPE NO.	WATTAGE RATING	DIMENSIONS L (inches)	D	MAXIMUM RESISTANCE
27E	5	1⅛	⅜	17,500 Ω
28E	10	1⅞	⅝	35,000 Ω

Standard Resistance Tolerance: ±5%

SPRAGUE

PIONEERS IN ELECTRIC AND ELECTRONIC DEVELOPMENT

NORTH ADAMS, MASSACHUSETTS

EXPORT FOR THE AMERICAS: SPRAGUE ELECTRIC INTERNATIONAL LTD., NORTH ADAMS, MASS. CABLE: SPREXINT.

HUMAN FACTORS IN THE DESIGN OF ELECTRONIC COMPUTERS

John Bridgewater
New York

Although electronic computers require less human intervention than earlier data-processing equipment, they are not wholly automatic, nor is it likely that they will be for many years. The operation of electronic computers still requires considerable contact with human beings. They have to read original documents or indicators on panels of machines. They have to enter information and instructions, by keys, switches, etc. They have to move tapes or cards from and to machine units. They have to inspect and remove the output. They have to check and maintain the equipment.

Contrary to a popular impression, in many respects the role played by the human being has become distinctly more important. As the performance of machines has improved, the performance of human beings has become a more conspicuous limitation in using them well. Machine reliability has increased to the point where in some machines internal error is very rare; yet the human operator remains highly susceptible to error, and currently is perhaps the major source of errors in the operation of computers. In addition, human beings by errors may injure the equipment; and the high price of good operators is an additional aspect of the important role currently played by the human beings. Economical and effective operation of computers thus continues to depend very much upon the work of the staff that operates it.

There are two possible ways to improve human performance in this man-machine relationship. One evident possibility is to select and train operators more carefully -- this is the fitting of the man to the machine. Another possibility, the main topic here, is to engineer the machine more carefully, to fit the machine more appropriately to the man, an activity now often referred to as "human engineering".

Human Engineering

Human engineering aims to fit equipment to the anthropometric, physiological, and psychological abilities and limitations of the human operator, taking into account many requirements referred to as work simplification. This kind of engineering considers the requirements of human beings at the planning and design stages, at the same time and along with other design requirements. It is a valuable supplement to personnel selection and training. It was first systematically applied during World War II, and to date has contributed greatly to good design of many articles for industry, consumers and the military. For it is much better to design into equipment from the start those features which will allow effective operation by human beings, than, at the end of the process of manufacture and trial, to discover and modify neglect of the requirements of human operators.

Fitting of computer equipment to the human operator is a task that the design engineer can perform by using data and techniques which have been developed, assembled, and made accessible. (See for example the bibliography at the end of this article.) In commencing this task, it is particularly important for him to remember that the people who will ultimately operate the equipment will have many characteristics different from his own. The ultimate user and operator should always be remembered.

System Analysis

What is the first step in the human engineering of a computing or data-processing machine? It is the analysis of the tasks to be performed by the particular apparatus. The purpose of the analysis is to determine those tasks which should be assigned to the machine and those tasks which should be assigned to the human being. The human being of course should be assigned tasks which are within his capacity, and where he surpasses the machine. Among these capacities are the following:

a. Ability to reason inductively and arrive at a best method
b. Ability to exercise judgment in a complex situation
c. Ability to improvise, to use flexible procedures

d. Ability to store very large amounts of information for long periods of time and often recall a relevant fact at an appropriate time

Present-day machines appear to surpass human beings in the following:

a. Ability to perform repetitive, routine tasks
b. Ability to do many things at once
c. Ability to store information briefly, then erase it completely
d. Ability to respond very quickly and smoothly to signals
e. Ability to reason deductively and perform rapid computations

Contact of Machine with Human Being

Next, what are the human requirements in the design of equipment which the human operator is to have contact with? What kinds of persons will operate the equipment? Particularly, what is their sex, their education, their experience with computers? What is the environment in which they will use the equipment?

Here is where appropriate anthropometric, physiological and psychological data may be used, if the group of operators is like the group for which data has been obtained. Here is where reference to principles of work simplification may be useful.

What are the machine units where information and instructions will be given to the computer? Here are points most deserving of human engineering attention; here opportunities for errors and delays are serious. Fitting of these units to the requirements of human operators contributes a great deal towards reduction of errors, and may be quite inexpensive.

Design of Documents

How are the original documents laid out? so that the human operator may easily copy information to be entered by keyboard or typewriter? Documents that present information in an unsystematic order ask for trouble. Material to be copied lying flat on one side instead of held upright, in front of the operator, in a holding and turning device, asks for operator fatigue.

Design of Indicators

What about the indicators on the machine? If a good deal of information about the condition of the computer is to be presented, would a visual or an auditory indicator be better? Auditory signals may be valuable for alarms or when the operator's eyes may be overloaded.

A man can absorb only so much: it is desirable to limit indicated information to the essential minimum.

There are three types of visual indicators: (1) the "yes-no" type; (2) the relative type for a reading of quality; and (3) the absolute type for a reading of quantity. That form of indicator should be chosen which is like a good speech: just long enough to give the essential points, and short enough to be interesting.

When signal lights are used, what about consistency in the meaning of color? appropriate brightness? location? grouping? Each functional group of display lights should be well defined and well located, and so arranged that changes in signals will be quickly and easily seen.

Design of Controls

The information taken from documents, from indicators and in other ways goes into the computer by means of various input devices or controls. Is the input device matched with the speed and accuracy of the human operator? Are the keys or controls that are pressed by the human operator visually indicated? so that they can be verified at once? Would it be useful to produce a printed or tape record of input? so as to verify or reconstruct input at a later time? Of course, where a standard program of computing is to be performed on data, the operator's work should be reduced to simple entry of data and actuation of the program.

For the entry of instructions, various types of controls may be used. They should be few, so as not to burden the operator with too much to control. There are four basic types: (1) "discrete" -- a single movement of any member of the body; (2) "repetitive" -- discrete movements performed a number of times; (3) "serial" -- discrete movements that involve starting, stopping and changes in direction; and (4) "continuous" -- constantly changing motor adjustments in response to constantly changing stimuli -- as in controlling the steering wheel of a motor car. Most computer controls will be of the discrete, on-off, stop-start type. Nevertheless, it is important to choose the most appropriate control. Push-type controls are the fastest to operate, easy to identify, and in general superior to controls of the multi-position selector type. Toggle switches are well suited for "on-off" operations where operation is infrequent. Rotary switches, although they simplify panels, are slow to use.

(continued on page 10)

Roster of Organizations in the Field of Computers and Automation

(Supplement, information as of June 3, 1954)

The purpose of this Roster is to report organizations (all that are known to us) making or developing computing machinery, or systems, or data-handling equipment, or equipment for automatic control and materials handling. In addition, some organizations making components may be included in some issues of the Roster. Each Roster entry when it becomes complete contains: name of the organization, its address and telephone number, nature of its interest in the field, kinds of activity it engages in, main products in the field, approximate number of employees, year established, and a few comments and current news items. When we do not have complete information, we put down what we have.

We seek to make this Roster as useful and informative as possible, and plan to keep it up to date in each issue. We shall be grateful for any more information, or additions or corrections that any reader is able to send us.

Although we have tried to make the Roster complete and accurate, we assume no liability for any statements expressed or implied.

This listing is a supplement to the cumulative listing in the April issue of "Computers and Automation", vol. 2, no. 4, and the supplement in the May issue, vol. 4, no. 5.

Abbreviations

The key to the abbreviations follows:

Size
- Ls Large size, over 500 employes
- Ms Medium size, 50 to 500 employees
- Ss Small size, under 50 employees (No. in parentheses is approx. no. of employees)

When Established
- Le Long established organization (1922 or earlier)
- Me Organization established a "medium" time ago (1923 to 1941)
- Se Organization established a short time ago (1942 or later) (No. in parentheses is year of establishment)

Interest in Computers and Automation
- Dc Digital computing machinery
- Ac Analog computing machinery
- Ic Incidental interests in computing machinery
- Sc Servomechanisms
- Cc Automatic control machinery
- Mc Automatic materials handling machinery

Activities
- Ma Manufacturing activity
- Sa Selling activity
- Ra Research and development
- Ca Consulting
- Ga Government activity
- Pa Problem-solving
- Ba Buying activity

(Used also in combinations, as in RMSa "research, manufacturing and selling activity")

*C This organization has kindly furnished us with information expressly for the purposes of the Roster and therefore our report is likely to be more complete and accurate than otherwise might be the case. (C for Checking)

*A This organization has placed an advertisement in this issue of COMPUTERS AND AUTOMATION. For more information, see their advertisement. (A for Advertisement)

ROSTER

Burroughs Corporation (formerly Burroughs Adding Machine Co.) 6071 Second Ave., Detroit, Mich./ Triangle 5-2260 / — headquarters; Burroughs Corporation Research Center (formerly Research Division), Paoli, Pa.; and elsewhere *C
Adding machines, bookkeeping machines, etc. Research Center has made Burroughs Laboratory Computer, an electronic digital test computer, assembled from pulse control units. Fast access magnetic core memory. Pulse control components, servomechanisms, etc. This company owns Control Instrument Co. Ls (18000) Le(1896) DSc RMSPa

California Computer Products, 3927 West Jefferson Blvd., Los Angeles 16, Calif /
Digital point plotter (CCP 701) and other equipment. DAc RMSa

Coleman Engineering Co., 6040 West Jefferson Blvd., Los Angeles 16, Calif /
"Digitizer", a device for converting rotational shaft positions into electrical contact settings, and other equipment. DAc RMSa

Computyper Corp., subsidiary of Friden Calculating Machine Co., Inc., San Leandro, Calif. /
SEE Friden Calculating Machine Co.

Eckert-Mauchly Div., Remington Rand, Inc., 3747 Ridge Ave., Philadelphia, Pa., and elsewhere/ *C, *A
All purpose electronic digital computers. Univac Factronic System. Ls(600?) Se(1946) Dc RCMSa Also see Remington Rand, Inc.

Engineering Research Associates, Div. of Remington Rand, Inc., 1907 Minnehaha Ave., St. Paul, Minn., and 510 18th St. South, Arlington, Va./ *C, *A
Digital computers; ERA 1101 and 1103 electronic digital computers; the Logistics Com-

puter. Magnetic storage systems, including magnetic heads, magnetic drums, etc. Shaft-position indicator systems, self-recording accelerometers, analog magnetic recording systems, data-handling equipment, special purpose communications equipment, pulse transformers. Ls(750) Se(1946) Dc RMCPSa Also see Remington Rand, Inc.

Ferranti Electric, Inc., 30 Rockefeller Plaza, New York 20, N. Y. / Circle 7-0911 / agent for Ferranti Electric Ltd., Moston, England, and Mount Dennis, Toronto, Canada. *C
Complete electronic digital computers (Ferranti; also called "Manchester Universal Electronic Computer"). High-speed photoelectric tape reader, which can read up to 200 characters per second. Magnetic drum and electrostatic storage components, etc. Ls(10,000) Le(1896) Dc RMSa

Ferroxcube Corporation of America, 377 East Bridge St., Saugerties, N. Y. / Saugerties 1000 / *A
Ferrite core materials, including pot cores, cup cores, recording heads, and microminiature toroids with square hysteresis loop. Magnadur permanent magnet materials. Ms(100) Se Ic RMSa

General Ceramics Corporation, Keasbey, N. J. (near Perth Amboy) / Valley 6-5100 / *C
Magnetic cores and ferrites for computer components; toroidal ferrite cores as memory devices for computers, as used in Whirlwind (MIT) computer new rapid memory; technical ceramics, insulators, etc. Ls(500) Le(1906) Ic RMSa

Hughes Research and Development Laboratories, Hughes Aircraft Co., Culver City, Calif. *A
Automatic data-handling systems. Industrial process control systems. Small, powerful, automatic electronic digital computer for airborne use. Fire-control equipment. Aircraft control. Navigation systems. Ls Me DAc RMSa

Intelligent Machines Research Corp., 1101 Lee Highway, Arlington, Va. / Jackson 5-7226 / *C, *A
Devices for reading characters on paper, etc. Pattern interpretation equipment. Sensing mechanisms. Digital computer elements. Ss (10) Se(1951) Dc RCMSa

International Business Machines Corp., 590 Madison Ave., New York 22, N. Y. / Plaza 3-1900 / and elsewhere *C, *A
Punch card machines. Type 650, Magnetic Drum Calculator. IBM electronic Data Processing Machines, Type 701, Type 702, (magnetic tape, magnetic drum, electrostatic storage). Card Programmed Calculator. Electronic calculating punch Type 604. Data processing equipment. Process control equipment. Automatic Source Recording Equipment. Ls(42,000) Le(1911) Dc RMSa

Kearfott Co., Inc., Engineering Div., Clifton, N. J./ SADAC (Servo-Analog-Digital-Analog-Converter) and other equipment. DAc RMSa

Ketay Manufacturing Co., 555 Broadway, New York 12, N. Y. / Digby 9-2717 / and elsewhere *A
Automatic control systems; synchros, servomotors, resolvers; magnetic, electronic, and resolver amplifiers. Electronic equipment. Servomechanisms. Ls(2000) Se(1943) CISc RMSa

Librascope, Inc., 1607 Flower St., Glendale, Calif. *C
Mechanical and electrical computers. Computing and controlling equipment for military applications and for banking, department stores, inventory and production control, etc. Airborne digital computers. All phases of data-handling. Ls(1200; approximately 350 on digital computers) Me(1937) DASc RMSa

Marchant Calculators, Inc., Oakland 8, Calif. *C
Desk calculators. Marchant-Raytheon Binary-Octal Desk Calculator. Ls(2700) Le(1910) Dc RMSa

Monrobot Corp., Morris Plains, N. J. / Morristown 4-7200 / *C, *A
Monrobot automatic electronic digital computers. Subsidiary of Monroe Calculating Machine Co. Ss(32) Se(1952) Dc RMSa

Raytheon Manufacturing Co., Waltham, Mass. / Waltham 5-5860 / *C, *A
Electronic digital computer systems for scientific applications (RAYDAC), and for general accounting and data-handling applications. Tape-handling mechanisms, magnetic heads, magnetic shift registers, and other computer components and subsystems. Computing service to analyze problems in applied mathematics, in engineering, and in industrial logistics by digital computer. Radar, fire control, microwave equipment, etc. Ls(20,000) Me(1925) DAc RMSa

Remington Rand, Inc., 315 4th Ave., New York 10, N. Y. / Spring 7-8000 / and elsewhere / *C, *A
Punched card machines, office machines, electronic digital computing systems (Univac Factronic Systems, ERA 1101, ERA 1103) servomechanisms. Typewriters, office machines, and equipment, etc. SEE also Eckert-Mauchly Division and Engineering Research Associates Division. Ls(30,000; 1800 on computers) Le DASc RCMSa

Soroban Engineering, Inc., Box 117, Melbourne, Fla.
Electronic digital computers of the FLAC and SEAC type; computer auxiliaries such as high-speed tape perforators (240 characters per second), coded automatic keyboards, automatic format tabulators, etc. Ss Se(1953) Dc RMSa

Sprague Electric Co., 377 Marshall Street, North Adams, Mass. *A
Capacitors: miniature, and low dielectric hysteresis loss, for computer applications. Standard capacitors; precision and power type resistors; pulse transformers; radio interference filters. Ls ?e Ic RMSa

Sylvania Electric Co., Radio and Television Div., 70 Forsyth St., Boston 15, Mass. / Kenmore 6-8900 / and elsewhere / *C, *A
Electronic digital computers using printed circuit techniques. Subassemblies of diodes and triodes. Computer components. Ls(2200; this division 190) Le(1901; this division 1945) DAc RMSa

Teleregister Corp., 157 Chambers St., New York 7, N. Y. / Digby 9-4440 / and

Teleregister Corp. Engineering Laboratories, 445 Fairfield Ave., Stamford, Conn. / Stamford 48-4291 / *C
Digital and analog special purpose computers. Data inventory systems for special applica-

(continued on page 33)

(continued from page 7)

The speed and accuracy of the operation of controls can be promoted by the use of a system of colors and shapes, adequate separation between controls, grouping on the basis of function, their importance, and how often they are used. It is most important to provide consistency in the pattern of movements, and a sufficient projection for the human operator to grasp easily. It is also good to locate controls so that sequences of hand and body motions can be employed, and so that both hands can be used. Arm reach, and data about other body dimensions, for the types of persons who are to operate the equipment, will be of value, along with the guides of work simplification.

It is important to identify controls by short, distinctive, easy-to-read titles, placed close to and preferably above the units identified. The possibility of unintended movements by the human operator of patchcord wiring, or of projecting controls, should be reduced to a minimum by location, design or other protective efforts.

Workplace Design and Layout

In the mounting and positioning of human-operated input, output and control units, what about the position, seated or standing, from which they will be operated? What about the body size of the operator? Is ample space provided for the operator's legs, knees, and feet? There is considerable variation in the body size of male and female office workers, and it must be taken into account, in establishing work heights, and location of controls. The use of body-size data of the average adult man is not satisfactory; what the small woman or large man needs is neglected, to the extent that in some instances may mean discomfort, fatigue, and reduction of the worker's output. Construction-wise, straight control and indicator panels are advantageous, but they often place controls other than those in the center beyond the reach of the normal elliptical work area of the human operator. If a keyboard or typewriter which is oversized in terms of its height is placed on top of a desk of conventional height, this will destroy a comfortable and efficient workplace.

In providing a workplace which is occupied for many hours each day by a single worker, it is useful to remember that the office worker has been accustomed to and is quite interested in a desk-like workplace, with drawers, both for his status and his convenience. Yet more and more machines are appearing in offices showing a trend away from desk-type workplaces. But the interests and satisfactions of workers remain forces worthy of consideration and remembering.

Centralized electronic computer equipment has consolidated the processing formerly performed by a larger number of separate units in punched card machine systems. This has reduced the amount of materials handling required of the human operator. But some handling, however, does still exist in connection with computers. Documents are moved to the neighborhood of input preparation units; tapes may be moved to or from storage or machine units; output documents are taken away. Is it possible to reduce human time and effort required in such manual handling? Perhaps this can be done by recognizing the sequence of use, the frequency of use, and similar factors. Also, how easy and effective is communication between operators? This also, by awareness of the problem, can be improved.

Design for Ease and Maintenance

Computer equipment is valuable; it is important to use it fully; and well-trained maintenance men are rare and costly. How can we simplify maintenance? and adjust for the limitations and capabilities of maintenance men?

Units may be located in vertical cabinets. The top of the cabinet can be well within reach. Other possibilities are: pull-out or swing-out panels, plug-in components, unitizing of major elements or circuits, easy replacement of parts with a minimum of interruption to computer operation, color coding of circuitry and components; indicator lights to identify malfunctioning units.

Although authorized maintenance men should have easy access, unauthorized people should have difficult access. How? Possibilities include remote location, locked cabinets, etc.

Noise and Heat Control

A computing machine may make a lot of noise and heat, as well as answers. This may disturb and tire the operators. The computer manufacturer can reduce these disturbances by seeking quiet and cool components, or designing special mountings, enclosures, cooling systems, etc. Some of the worst offending units can be located remotely from the human-operated input, output and control units.

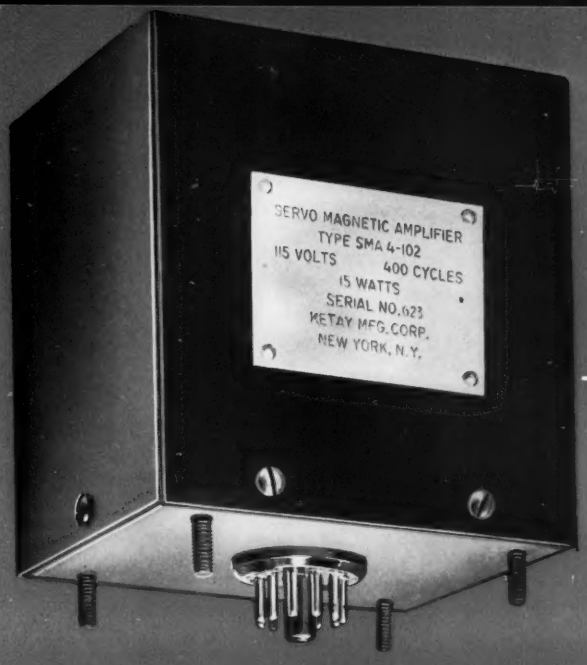
Appearance

The appearance of computer equipment is another pertinent consideration from the point of view of human engineering. Modern and attractive styling can bring pride and satisfaction both in the persons owning the equipment and those working with it. Also such styling

(continued on page 17)

Ketay

presents



... *meticulously tailored*

MAGNETIC AMPLIFIER SERVO SYSTEMS

Typical characteristics of some magnetic amplifier and two-phase servo motor combinations available from Ketay.

SPECIFY MAGNETIC AMPLIFIER (type)	FREQUENCY (cps)	LINE VOLTAGE (volts)	LENGTH (inches)	WIDTH (inches)	HEIGHT (inches)	SPECIFY SERVO MOTOR (type)	TORQUE AT STALL (oz. in.)	MOMENT OF INERTIA (oz. in. x sec^2 x 10^4)	ACCELERATION AT STALL (rad./sec^2)	NO LOAD SPEED (min. r.p.m.)	RATED VOLTAGE EXCITATION FIXED PHASE (volts) *	INPUT POWER PER PHASE AT STALL (watts)	DIAMETER (inches)	LENGTH (inches)
SMA6-102	60	115	4 1/2	3 3/4	3 7/8	K402530	2.5	49.5	50,500	3300	115	9.2	1 3/4	2
SMA6-102	60	115	4 1/2	3 3/4	3 7/8	K402380	1.45	42.8	35,000	3200	115	5.0	1 7/16	1 5/8
SMA4-102	400	115	4 1/8	3 5/16	4 3/16	K402550-1	2.35	49.5	47,500	4800	115	9.2	1 3/4	2
SMA4-102	400	115	4 1/8	3 5/16	4 3/16	K402550-2	2.35	49.5	47,500	4800	115	9.2	1 3/4	2
SMA4-102	400	115	4 1/8	3 5/16	4 3/16	K101600-6	1.45	42.8	35,000	4800	115	6.1	1 7/16	1 5/8
SMA4-102	400	115	4 1/8	3 5/16	4 3/16	K101660	1.45	42.8	35,000	4800	115	6.1	1 7/16	1 5/8

BUORD DESIGNATIONS FOR SERVO MOTORS

K101600-6 = MK 7 MOD 0 K101660 = MK 7 MOD 1

K402550-2 = MK 8 MOD 1 K402550-1 = MK 8 MOD 0

* The control phase of all Servo Motors should be connected for 57.5 volt operation.

On the other side of this page are listed some of the synchros for which the combinations were specially designed.

Ketay supplies complete systems including gear trains and stabilization for given kinematic requirements.

Servo motor-tachometer generator combinations are also available.

Ketay welcomes the opportunity to design and fabricate amplifiers of both the conventional and miniaturized types to customer's specifications.

SYNCHROS • SERVO MOTORS
RESOLVERS • MAGNETIC AMPLIFIERS
AIRBORNE INSTRUMENTS
AUTOMATIC CONTROL SYSTEMS

Ketay

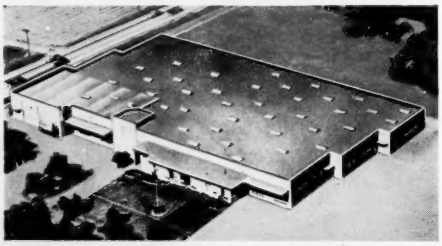
MANUFACTURING CORP.
Executive Offices
555 Broadway, New York 12, N. Y.

KETAY OFFERS A COMPLETE RANGE OF SIZES AND TYPES IN SYNCHROS • SERVO MOTORS RESOLVERS

1–SERVO MOTOR, Size 10 Frame, O.D. .937″
2–SYNCHRO, Size 10 Frame, O.D. .937″ (Transmitter, Receiver, Resolver, Differential Transmitter, Control Transformer)
3–SERVO MOTOR, Size 10 Frame, O.D. .937″
4–SYNCHRO, Size 11 Frame, O.D. 1.062″ (Transmitter, Resolver, Control Transformer)
5–SERVO MOTOR, Mk 14, Size 11 Frame, O.D. 1.062″
6–SYNCHRO, Size 15 Frame, O.D. 1.437″ (Transmitter, Receiver, Resolver, Differential Transmitter, Control Transformer)
7–SERVO MOTOR Mk 7, Size 15 Frame, O.D. 1.437″
8–SYNCHRO, Size 15 Frame, O.D. 1.437″ (Transmitter, Receiver, Resolver, Differential Transmitter, Control Transformer)
9–LINEAR TYPE CONTROL TRANSFORMER, O.D. 1.625″
10–SERVO MOTOR, Mk 8, Size 18 Frame, O.D. 1.75″
11–INDUCTION MOTOR, Size 20 Frame, O.D. 1.95″
12–SYNCHRO, Size 16 Frame, O.D. 1.537″ (Transmitter, Receiver, Control Transformer)
13–SYNCHRO, Size 18 Frame, O.D. 1.750″ (Transmitter, Receiver, Differential Transmitter, Control Transformer)
14–INDUCTION MOTOR, Size 18 Frame, O.D. 1.750″, 3 Phase, 2 Pole
15–SYNCHRO, Size 19 Frame, O.D. 1.90″ (Transmitter, Receiver, Control Transformer)
16–SYNCHRO, Type 1F, 1HCT, or 1HG Size 1 Frame, O.D. 2.250″ (Receiver, Transmitter, Control Transformer)
17–INDUCTION MOTOR, Size 1 Frame, O.D. 2.250″
18–SYNCHRO, Size 23 Frame, O.D. 2.250″ (Transmitter, Receiver, Resolver, Differential Transmitter, Control Transformer)
19–SERVO MOTOR, Size 23 Frame, O.D. 2.250″
20–SYNCHRO, Size 31 Frame, O.D. 3.10″ (Transmitter, Receiver, Differential Receiver, Differential Transmitter)

Typical characteristics of 116 units are available.

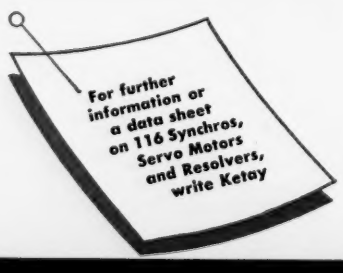
ADDITIONAL FACILITIES TO SERVE THE INDUSTRY



This plant, recently acquired at Commack, Long Island, adds air-conditioned work space that brings Ketay's total area to over 200,000 square feet, accommodating over 2,000 employees in the five divisions. Modern in every detail, the new plant has the latest equipment for precision volume production.

EXPERIENCE + RESEARCH + PERFORMANCE = LEADERSHIP

New developments and applications... increased facilities for volume production of components and complete systems... all the things reported on these pages are characteristic of Ketay—a firm with broad experience and specialized knowledge that adds up to leadership in the field of electrical devices and controls. This experience and knowledge is yours to command. In addition to synchros, servo motors and resolvers, it includes, but is not limited to: gyro components; aircraft engine instruments; computers; magnetic, resolver and synchro amplifiers; remote indicators and automatic control systems. Ketay's completely staffed and equipped Research and Development Division can be of greatest service during the design stage of applications involving Ketay products. You are invited to avail yourself of this service.



Ketay
MANUFACTURING CORP.

Executive Offices 555 Broadway, New York 12, N. Y.
Pacific Division, 12833 Simms Avenue, Hawthorne, California

New York Division • Kinetix Instrument Division • Pacific Division
Electronic Instrument Division • Research & Development Division

AUTOMATION -- LIST OF OUTSTANDING EXAMPLES

(Edition 1, cumulative, information as of June 3, 1954)

The purpose of this list is to report some outstanding examples of automation — of automatic production, automatic materials handling and automatic control. Each entry contains: industry area / name and location of organization(s) / a brief description. No objective criterion as to whether or not any particular example should or should not be included has yet been determined. We shall be grateful for any comments, corrections, and proposed additions or deletions, which any reader may be able to send us.

LIST

Agricultural processing: sugar cane cleaning/ Waialua Agricultural Co., Hawaii / closed circuit television so that technicians in the mill may have a continuous view of the cane as it moves from the cleaning plant to the grinding machinery.

Automobile production: engine block milling Ford Motor Co., Cleveland / automatic process for finishing rough engine-block castings, fitting them with pistons, etc.

Atomic energy: manipulation of radioactive material / General Electric, Schenectady, N Y (?) / the O-Man, a 15-ton "claw" operated by remote control.

Baking: pretzel tying / American Machine and Foundry, New York / machine which automatically makes pretzels out of dough and ties them.

Consumer goods: "TV eye" / Radio Corp. of America, Engineering Products Dept., Camden, N J / low-cost (under $1000) private wire television, for watching at a distance as: in a bank, to compare signatures with originals; in a home, to watch a baby in a nursery; in a school, to let many students see what formerly only a few students could see; etc.

Electronic equipment: assembly - "Project Tinkertoy" / National Bureau of Standards, Washington, D C, and U. S. Navy, Bureau of Aeronautics, Washington, D C / a program of research in production involving a design system called "Modular Design of Electronics", and an automatic production system called "Mechanized Production of Electronics"; present "modules" are stacked assemblies of ceramic wafers imprinted with circuit patterns and bearing miniature electronic parts.

Electronic equipment: assembly of radio chassis / Raytheon Mfg. Co., Radio and Television Div., Chicago / an assembly line able to produce 1000 chassis a day is operated by 2 workers instead of 200

Electronic equipment: assembly / Sylvania Electric Products, Inc., Bayside, N Y, and U. S. Air Force, Washington, D. C. / cylindrical stacks of components are snaplocked into a flexible printed circuit and each cylindrical assembly is soldered by indexed rotation in a specially designed multiple-head soldering machine.

Factory production: assembly of components / General Electric Co., Syracuse, N Y, and U. S. Signal Corps, Washington, D. C. / development of appropriate sensing, controlling, and acting devices for an automatic system for assembly of components.

Factory production: machine tool operation / Mass. Inst. of Technology, Cambridge, Mass. a machine tool is operated by a computer which is controlled by a paper tape containing all the instructions in a blueprint drawing.

Factory production: machine tool operation by "record playback control" / General Electric Co., Syracuse, N Y / a skilled machine operator machining a part has all his operations recorded on a tape; when the tape is played back, the machine faithfully repeats the original motions.

Music: phonograph record-making / Columbia Records, Inc., Bridgeport, Conn / 16 men with new automatic machines turn out the work of 1000 men with old machines.

Ordnance: explosives / U. S. Army, Joliet, Ill/ a completely automatic factory for the production of TNT.

Ordnance: shells for explosives / W. F. and John Barnes Co, Rockford, Ill. / factory makes shells from start to finish without touching by humand hands.

Recreation: bowling / American Machine and Foundry, New York / automatic pin spotter collects knocked-down pins, and sets up new pins, exactly as required for bowling.

Transportation: conveyer belt / Goodyear, Industrial Products Div, Akron, Ohio, and Pennsylvania Railroad, Philadelphia, Pa / reinforced-rubber conveyor belt takes iron ore (lumps up to 300 pounds) from ore vessels unloading at a pier, rises 80 feet, and fills freight cars at the end of the pier; works at a rate of 5000 tons per hour.

WHAT IS A COMPUTER?

Neil Macdonald
New York

The other day we were talking with a manufacturer who has made and sold many good analog computers. He said to us "I still don't know what a digital computer is". This made us stop to wonder if each reader , or would-be reader, of "Computers and Automation" could give a good answer to such questions as these:

What is a computer?
What is the difference between an analog and a digital computer?
How does a computer actually compute?

According to Geoffrey Ashe, in his article "Introducing Computers to Beginners" (see "Computers and Automation", March, 1954),some computer men, and perhaps many, can hardly explain the operation of a computer in simple language to people who are new to the field. Yet this is important. The field of computers and automation can grow rapidly only if simple yet correct explanations can be given easily. I have often felt that somebody explaining something to me was explaining Greek by the use of Sanskrit, leaving me as much in the dark as ever.

Would it be a good idea to print in these pages from time to time basic information about computers, bringing the information up to date at each printing? For, just as the Roster of Organizations and the Glossary published here are useful reference information, so basic information about computers might be equally useful as reference material, even if an article or dialogue form rather than in a series of bare definitions.

A newspaper in fact also regularly makes a compromise between publishing information which is news, and publishing information which is a summary of what has happened before. In this way people who have missed the earlier parts of a developing story are able to understand the whole story.

Question: What is a computer?

Answer: A computer is a person or machine that is able to take in information (problems and data), perform reasonable operations on the information, and put out answers. A computer is identified by the fact that it (or he) handles information reasonably.

For example, a human being aided by pencil and paper may be a computer. He may take in information, write some of it on the paper, perform reasonable operations upon the information, and come out with an answer. Likewise a machine may be able to take in information, record it in the arranging or positioning of some of the equipment inside the machine, perform reasonable operations upon that information, and come out with an answer. Both are computers.

Question: What are reasonable operations?

Answer: Reasonable operations are logical and mathematical operations. Mathematical operations include addition, subtraction, multiplication, division, taking square root,etc., and also more advanced mathematical operations such as raising to a power, finding the derivative, and integrating. Logical operations include comparing, selecting, sorting, matching, merging, determining the next instruction which is to be performed, etc. These are reasonable operations on information.

Reasonable operations are those operations which are correct logically or mathematically, and the definition of this brand of correctness can be accomplished by tables of accepted results. For example, correct multiplication can be defined in terms of the multiplication table and a few rules.

From the viewpoint of the fundamentals of logic and mathematics, reasonable operations on information have these properties: they do not question the objective meaning of the starting data; they do not question the factual truth of the starting statements; but they do find out the implications contained in these data and statements.

Consider the argument: "The moon is made of green cheese; anything made of green cheese is a weighty object; and therefore the moon is a weighty object." Here the argument is logically valid (or computable), and the conclusion is (accidentally) true, although both premises are false. A computer specializes in deriving conclusions (logical or mathematical) without regard to the objective truth of the starting data.

The fact that reasonable operations do not depend on the meaning of the information is

what makes calculation fast. For instance, to add 111 and 444 and obtain 555 for the answer neither the person nor the machine has to remember the meaning of these numbers. In an appropriate kind of language, the operations can be carried on with the marks or symbols only. And then, to the everlasting wonder of nearly everybody, if the premises correspond with the real world, so do the conclusions.

Question: What is information?

Answer: Information is a set of marks that have meaning. Physically, the set of marks is a set of physical objects or a set of arrangements of some physical equipment. Then, out of this set, a selection is made in order to communicate, to convey meaning. For meaning to exist, there has to be a society of at least two persons or machines, a society that requires communication, that desires to convey meaning. By convention, the society establishes the meaning of the marks. The meaning exists independently of the particular kinds of marks that may be used; for example, "it is raining, il pleut, es regnet" all have the same meaning, although English, French, and German are the three kinds of sets of marks in which the meaning has been expressed.

The kinds of physical objects which can be used to express information are extremely varied. Many different kinds of equipment inside a machine may be used to record and manipulate information. In a desk calculating machine, information may be stored and manipulated in small counter wheels bearing geared teeth, and usually having ten positions corresponding to the digits 0, 1, 2 up to 9. In an automobile, a flexible cable running from a roller connected with one of the wheels to an indicator dial in the dashboard, records, by the amount and speed of its turning, the distance traveled by the automobile and its speed. In a great automatic electronic computer, such as the machine known as Univac, information may be recorded and manipulated as trains of minute electrical pulses which are millionths of a second apart; and the presence or the absence of a pulse in a position where either may occur is the basic code which represents information.

For the purposes of computing machines, information is an arrangement or positioning of equipment, and the social meaning of the arrangement makes no difference, except at the input and the output.

Question: How does a machine take in, record, and remember information?

Answer: In every case the machine contains equipment which can receive and record information. The ways in which the information may be taken in and recorded vary widely.

One way, for example, is by punching holes in paper tape or in a card, and then passing this tape or card into the machine; and the presence or the absence of the holes is detected by the machine by means of metal fingers or by closed or opened electrical circuits, and this causes the machine to store the pattern of the information in some part of its equipment. This is the digital form of information, a series of separate and distinct symbols, digits, letters, characters, yeses and noes; and the kind of computer which takes in and manipulates information in this form is called digital.

In general in a digital machine, in the course of a problem, each separate piece of information has to be remembered for a long or short time. It is stored in unchanging form in some of the equipment of the machine, called a register or a location. This might be for example a set of counter wheels, as in a desk adding machine, or a set of relays, as in a telephone system. Many automatic digital computers have 1000 registers for storing internally 1000 pieces of information at any one time. Any piece of information when called for is accessible to the calculating section of the machine with a very small waiting time.

A second way of putting information into a machine is for example by turning a dial or a wheel a certain amount, and causing some of the equipment in the machine to record how much turning has taken place. This is the method used in the automobile speedometer and the steering mechanism of a ship. This is the analog form of information, a magnitude of something or other, more exactly, a magnitude of a physical variable such as position, rotation, or voltage. The kind of machine which takes in and manipulates information in this form is called analog.

In general, in an analog machine, in the course of a problem, each different quantity occurring (either input or output or intermediate) is remembered for the whole time in a separate mechanism. This might be a rotating shaft, as in a fire control computer, or some electrical component, as in an electronic analog computer. This mechanism by its position or voltage or motion, etc., represents -- in fact measures -- the quantity in the problem. Some automatic analog computers of very high capacity may have 100 mechanisms for storing internally 100 quantities throughout the problem. Each mechanism is interconnected physically in a way that mirrors the mathematical relationship so that as time goes by,

the simultaneous change of all the mechanisms solves the problem.

It should be possible for one and the same machine to take in digital information in some ways and analog information in other ways, and this kind of machine may in the future combine the best features of both types of machines.

A simple everyday example of a small machine that can receive and record information in a digital way is the ordinary date stamp, that can stamp JUN 30 1954 for instance. The date stamp is made up of a frame, four rollers, and four little rubber belts; one of the belts contains in raised, reversed letters the month symbols JAN, FEB, MAR and so on down to DEC; two more little belts contain each the digits 0, 1, 2 up to 9; and the fourth belt contains say the years 1952, 1953, 1954, 1955, 1956, 1957. The date stamp at the beginning of a day is set by hand so that it records and thereby stores the date which that day is. Then the user of the date stamp, without himself remembering the date, can impress it on any sheet of paper and the machine will immediately state the date. When the day changes to the next one, the date shown by the stamp can be changed of course by turning small burred wheels next to each roller, thus changing the position of one or more rubber belts. In fact, if we should so desire, we could connect the date stamp to an electric alarm clock set to go off each midnight, thereby providing an impulse which (with a sufficiently Rube Goldberg apparatus) could cause the date stamp to be changed automatically from one date to the next date. We would then have a rudimentary automatic computer, able not only to take in and record information but also to manipulate it logically.

A simple everyday example of a small machine that can receive and record information in an analog way is a thermometer. This machine takes in and records the temperature of its surroundings. The length of its column of bright red liquid, when appropriately scaled, matches up with the temperature of the surrounding air. Yet it does not report immediately because it takes about three minutes, when moved into a new environment, for the thermometer to reach the temperature of its environment. One might argue that the graduations on the scale of the thermometer convert it into a digital machine; but this digital reporting (found in all analog computers to make it easy to copy down the answer) is extraneous to the analog character of the machine.

But there is no very easy way to hitch mechanically the temperature-responding length of one column of red liquid and the length of another column of such liquid; and so analog computers use other means than these for nearly all purposes of computation.

Question: How does a machine manipulate information? How does it actually compute?

Answer: To explain the different ways in which a computer actually computes, suppose we take a sample operation with information and show how it is handled by a human being engaged in computing and by a computing machine.

Let us take for the sample operation, the operation of finding twice a number, the operation expressed by the formula "p equals 2 times n", where p and n are numbers.

A human being will find twice a number in the following way. First, you have to tell him the number. Suppose that it is 76, -- that is, in this case n is to be 76. Then he will refer to the "two times" multiplication table which he has learned by heart, and will go through a procedure which he also learned by heart while in grade school. On paper he will write:

$$\begin{array}{r} 76 \\ \times\ 2 \\ \hline 152 \end{array}$$

but under his breath, as he writes this, he will say the procedure that he learnt:

> "2 times 6 is 12; put down the 2 and carry the 1; 2 times 7 is 14, and 1 to carry is 15, put down the 5 and carry the 1; there is nothing in the third column; 2 times zero is zero, and the 1 to be carried makes 1; put down the 1; the answer is 152."

An automatic analog computing machine will find twice a number in the following way. Suppose that the machine represents and stores each number by the amount of turning of a shaft or rod or axle. Imagine two shafts parallel to each other. We slide on to one of the shafts, the one which represents n, a gear with say 36 teeth. We slide on the other shaft, the one which represents p, a gear with 18 teeth--half as many teeth. We mesh the gears with each other and tighten them on their shafts so that they will not slip. We put a crank on shaft n so that we can turn it and thereby drive shaft p. Now we can see that no matter how much or how little we turn shaft n, shaft p will have to turn twice as much; and if shaft n has had 76 turns, then shaft p without any doubt at all must have had 152 turns. We notice that in this case the machine is set to

compute twice a number without our having to tell the machine specifically some particular number to begin with.

An automatic digital computing machine will find twice a number in the following way. In the first place such a computer is organized like a railroad system. This railroad system has four stations: Input; Output; Storage, which may contain 1000 sidings or registers; and Calculator, which may have registers A and B for two numbers being operated on, a register Op for the operation, and a final register R where the result of the operation is delivered. It also has a signal tower, Control. The units of information are like freight cars, which are flashed from one siding to another anywhere in the system, according to the instructions from the tower.

To find twice a number in this kind of computer, here is one typical method. The tower signals the register holding the number n, which flashes it into the calculator register A. The tower then flashes 2 into register B, and flashes "Multiply" into register Op. The Calculator then, by means of special circuits which are equivalent to a built-in digital multiplication table, doubles the number. The tower signals the Calculator what siding in Storage to send the result to, which is done, and the operation is then finished.

Question: What is an automatic computer?

Answer: An automatic computer is a computing machine that is able to operate by itself. It has an electric motor or some other source of energy. It has a program (or set of instructions) such that it is able to perform a long sequence of reasonable operations on information, with no human assistance. A modern automatic digital computer is even able to determine a large part of its own instructions by computing them too, and sending them into the Control tower.

The automatic program may of course be expressed in any one of many ways: in the wiring together of certain patch cords into certain sockets in terminal boards; in the punched holes of paper tape; in magnetized spots on magnetic tape; or in any of the forms of physical language acceptable to machines. For, any computing machine requires a language that it can deal with easily, just like a human being.

But there is really only one great simple secret -- although many people know it by now: a machine is perfectly well able to follow out a long series of instructions, performing reasonable operations, and adjusting them according to circumstances.

The application of this secret is destined to transform the world as we know it.

-END-

(continued from page 10)

may well impress potential buyers.

References

More information about human engineering may be found in a number of textbooks, articles, and reports. Some of these references are given below.

Bibliography

1. "Handbook of Human Engineering Data for Design Engineers", Tufts College Institute for Applied Experimental Psychology, Medford, Mass., 1949
2. "Applied Experimental Psychology", by A. Chapanis, C. Morgan, and W. Garner, John Wiley and Sons, New York, 1949
3. "Motion and Time Study", by Ralph Barnes, John Wiley and Sons, New York, 1949
4. "Human Factors in Underseas Warfare", Committee on Underseas Warfare, National Research Council, Washington, D. C., 1949
5. "Human Factors in Air Transport Design", by R. A. McFarland, McGraw Hill Book Co., New York, 1946
6. "Human Engineering", Conference on Human Engineering, New York Academy of Sciences, New York, 1951
7. "Human Engineering for an Effective Air Navigation and Traffic Control System", Editor: P. Fitts, National Research Council, Washington, D. C., 1951
8. "Human Body Size in Military Aircraft and Personal Equipment", by E. E. Randall, et al, AAF Technical Report 5501, Air Materiel Command, U. S. Air Force, Wright Field, Dayton, Ohio, 1946
9. "Structure of Human Ability", by P.E.Vernon, John Wiley and Sons, New York, 1950
10. "Man as an Element in a Control System", by W. E. Hick, Applied Psychology Research Unit, Medical Research Council of Great Britain, Cambridge, 1951
11. "Machines Tailored to Men", by Leonard C. Mead, in "Journal of the Society of Automotive Engineers", December, 1947
12. "The Human Engineer: New Ally for the Electrical Engineer", by Jack Dunlap, in "Electrical Manufacturing", February, 1952
13. "Measurements of Men for Making Machinery", by B. G. King, in "American Journal of Physical Anthropology", 1948
14. "Human Factors in the Design of Machinery and Work Methods", by C. B. Frisby, in "Occupational Psychology", London, Vol. 24, No. 3, 1950
15. "The Human Factor in Instrument Design", by Lynn S. Beals, in "Instruments", November, 1951
16. "Introduction to Human Engineering in Product Design", by Alex Javitz, in "Electrical Manufacturing", March, 1952
17. "The Human Operator", by W. Summer in "Time and Motion Study", London, November, 1952

-END-

AUTOMATIC COMPUTERS -- LIST

(Cumulative, information as of June 3, 1954)

The purpose of this list is to report automatic computers in existence (all that are known to us). Each entry, when complete, gives: name of computer (and interpretation of letters) / maker and place where made; if quantity is 1 or 2, place where computer is located / purpose of computer, nature of computer, approximate size or capacity of computer, and quantity of computer in existence. Some words like "Model" and "Type" have been omitted from names of computers; usually the initial letters of the company name have been substituted.

If only the name of the computer has been learned, a reference where the computer is mentioned or described is given.

In most cases the maker of the computer is the key to more information about the computer; the maker may be looked up in the "Roster of Organizations" which we publish (the last cumulative listing is in the April, 1954, issue of "Computers and Automation").

Abbreviations; The key to the special abbreviations follows:

Purpose (p)

Gp	General purpose
Sp	Special purpose

Nature of Computer (c)

Dc	Digital computer
Ac	Analog computer
Ec	Electronic computer
Rc	Relay computer
Mc	Mechanical computer

Size (s)

Ss	Small size or low capacity
Ms	Medium size or medium capacity
Ls	Large size or large capacity

Quantity (q)

Oq	Zero (i.e., unfinished or dismantled)
1q	One
2q	Two
Sq	Small quantity, about 2 to 6
Mq	Medium quantity, about 7 to 30
Lq	Large quantity, over 30
?q	Unknown quantity

Some other abbreviations have been used which can be easily guessed, like those in a telephone book.

We plan to keep this list up to date from time to time, and we shall be very grateful for any information which any reader is able to send us.

The total number of automatic computer types here reported is 136. The actual number of such types is doubtless larger.

LIST

ABC (Automatic Binary Computer) / Air Force Cambridge Research Center, Cambridge, Mass.; located there / Gp EDc Ms 1q

Abel / - / referred to in "A Programmer's Description of ABEL, A Magnetic Drum Computer", by J B Kruskal Jr, published by the George Washington University Logistics Research Project, Washington, D C

Ace (Automatic Computing Engine -- pilot model) / National Physical Laboratory, Teddington, England; located there / Gp EDc Ms 1q

Ace (Automatic Computing Engine) -- engineered model / English Electric Co, Stafford, Eng / Gp EDc Ms ?q

Aeracom (Bureau of Aeronautics Analog Computer) / Aerial Measurements Laboratory, Northwestern Univ, Evanston, Ill; located there / Gp EAc Ls 1q

Alwac / Logistics Research Inc, Redondo Beach, Calif / Gp EDc Ms Sq

Amos / - / referred to in footnote 7, in "Computing Bit by Bit" by Arthur L Samuel, in "Proceedings of the IRE", Oct 1953, p 1225

Anacom (Analog Computer) / Westinghouse Electric Co, Pittsburgh; located there / Gp EAc Ls 1q

Analog Computer / Electronic Associates, Long Branch, N J / Gp EAc Ls ?q

ANSER (Analog Simulator and Computer) 300-A / Davies Laboratories, Inc, Riverdale, Md / Sp EAc ?s ?q

APEXC (All Purpose X-ray Computer) / Birkbeck College, Univ of London, London, England; located there / Gp EDc Ms 1q

Arc (Automatic Relay Computer) / Birkbeck College, Univ of London, London, England; located there / Gp RDc Ms 1q

Arra / - / referred to in a report by A VanWijngaarden, in "Report of a Conference on High Speed Automatic Calculating Machines", edited by M V Wilkes, published in Cambridge, England, 1950

ASCC (Automatic Sequence Controlled Calculator) -- SEE: IBM Harvard Automatic Sequence Controlled Calculator, or Harvard Mark I

Avidac (Argonne Version Institute's Digital Automatic Computer) / Argonne Natl Lab, Chi; located there / Gp EDc Ls 1q

Barber-Colman-Stibitz Computer / Barber-Colman Co., Rockford, Ill; located there / Gp EDc Ss 1q

Bark (Binary Automatic Relay "K"omputer) / Swedish Board for Computing Machines, Drottninggatan 95A, Stockholm, Sweden; located there / Gp RDc Ls 1q

Beac (Boeing Electronic Analog Computer) / Boeing Airplane Co, Seattle / Gp EAc Ms Mq / -

Bell Model V / Bell Telephone Labs, New York; located at Ballistic Research Laboratories, Aberdeen Proving Ground, Aberdeen, Md / Gp RDc Ls 2q

Bell Model VI / Bell Telephone Labs, Murray Hill, N J; located there / Gp RDc Ms 1q

Bendix Digital Differential Analyzer — SEE Maddida

Besk (Binar Elecktronisk Sekvens-Kalkylator) / Swedish Board for Computing Machines, Drottninggatan 95A, Stockholm, Sweden; located there / Gp EDc Ls 1q

Binac (Binary Automatic Computer) / Eckert-Mauchly Div, Remington-Rand, Phila, Pa; located at Northrop Aircraft, Hawthorne, Calif / Gp EDc Ss 1q

Burroughs Laboratory Computer / Burroughs Adding Machine Co, Phila, Pa; located there / Sp EDc Ls 1-2q

Burroughs Unitized Digital Electronic Computer / Burroughs Corp; located at Wayne Univ, Compn Lab, Detroit / Gp EDc Ls 1q

Cadac — SEE CRC

Caldic (California Digital Computer) / Univ of Calif, Berkeley, Calif; located there / Gp EDc Ms 1q

CEC 30-201 / Consolidated Engrg Co, Pasadena, Calif / Gp EDc Ss Sq

Circle Computer / Hogan Labs, New York, & Nuclear Development Assoc, White Plains, N Y / Gp EDc Ss Sq

Computer / Dynamic Analysis and Control Laboratory, Mass Inst of Technology, Cambridge, Mass; located there / Gp EAc Ls 1q

Computer / Electronics Div, AERE, Harwell, England; located there / EDc

Computer / Haller, Raymond, and Brown, State College, Pa; located there / Sp EDc Ss 1q

Computer / Imperial College, Univ of London, London; located there / Gp RDc ?s 1q

Computer / Mathematisch Centrum, Amsterdam, Netherlands; located there / Gp RDc Ls 1q

Computer / Naval Special Devices Center, Pt Washington, N Y; located there / Dc Ls 1q

Computers / Academy N A U K, Leningrad, and other groups, USSR; located Leningrad and ? / Gp EDAc Ls, etc ?q / referred to in "The Soviet Union: Automatic Digital Computer Research" by T Fortuna, "Computers and Automation", Sept., 1953

Computyper / Friden Calculating Machine Co, San Leandro, Calif / Gp MDc Ss ?q

CRC 101, 102, 102-A, 107 / Computer Research Corp, Hawthorne, Calif / GSp EDAc SMLs Sq

CSIRO Mark I / Radiophysics Div, Commonwealth Sci and Indus Res Org, Sydney, Australia; located there / Gp RDc Ms 1q

Davis Computer / USAF Inst of Tech, Wright-Patterson Air Force Base, Dayton, Ohio; located there/ Sp EAc Ms 1q

Deuce / - / referred to in footnote 7 in "Computing Bit by Bit" by A.L Samuel, in "Proc IRE", Oct 1953, p 1225

Diad (Drum Information Assembler and Dispatcher)/ Bell Telephone Labs, Murray Hill, N J; located there / Sp Dc Ls 1q

Differential Analyzer / General Electric Co, Schenectady; located there / Gp MAc Ls 1q

Differential Analyzer No. 1 / MIT Electrical Engrg Dept, Mass Inst of Technology, Cambridge, Mass; located at Wayne Univ Compn Lab, Detroit, Mich/ Gp MAc Ls 1q

Differential Analyzer No. 2 / MIT Electrical Engrg Dept, Cambridge; located there / Gp EAc Ls 1q

Differential Analyzer / Moore School of Electrical Engrg, Univ of Pa, Phila; located there / Gp MAc Ls 1q

Dyseac ("di-" -second - Standards Eastern Automatic Computer) / National Bureau of Standards, Washington; mounted on a truck / Gp EDc Ls 1q

Ease (Electronic Analog Simulating Equipment) / Berkeley Division, Beckman Instrument Co, Richmond, Calif / Gp EAc ?s ?q

Edsac / Univ Mathematical Lab, Cambridge, England; located there / Gp EDc Ls 1q

Edvac (Electronic Discrete Variable Automatic Computer) / Moore School of Electrical Engrg, Univ of Pa, Phila; located at Ballistic Research Labs, Aberdeen Proving Ground, Aberdeen, Md / Gp EDc Ls 1q

Elecom 100 / Electronic Computer Corp, L I City, N Y / Gp EDc Ss Sq

Elecom 120 / Electronic Computer Corp, L I City, N Y / Gp EDc Ss Sq

Elecom 200 / Electronic Computer Corp, L I City, N Y / Gp EDc Ls Sq

Elliott-NRDC Computer 401 Mk 1 / Elliott Brothers Res Labs, Borehamwood, Herts, England; located there / Gp EDc Ls 1q

Eniac (Electronic numerical integrator and calculator) / Moore School of Electrical Engrg, Univ of Pa, Phila, Pa, and Ballistics Res Lab, Aberdeen, Md; located at Ballistic Research Labs, Aberdeen Proving Ground, Aberdeen, Md / Gp EDc Ls 1q

ERA 1101, 1102, 1103 / Engineering Res Assoc Div, St Paul / Gp EDc Ls Sq

Ferranti / Ferranti Electric Co, Moston, Manchester, England / Gp EDc Ls Sq

Ferut — the Ferranti computer at the University of Toronto; SEE Ferranti

Flac (Florida Automatic Computer) / Air Force Missile Test Center, Patrick AFB, Fla; located there / Gp EDc Ls 1q

GEDA (Goodyear Electronic Differential Analyzer) L2, L3, N3 (linear and non-linear models) / Goodyear Aircraft Corp, Akron, Ohio / Gp EAc ?s ?q

Harvard Mark I — SEE: IBM Automatic Sequence Controlled Calculator

Harvard Mark II / Harvard Compn Lab, Cambridge, Mass; located at Naval Proving Ground, Dahlgren, Va / Gp RDc Ls 1q

Harvard Mark III / Harvard Compn Lab, Cambridge, Mass; located at Naval Proving Ground, Dahlgren, Va / Gp EDc Ls 1q

Harvard Mark IV / Harvard Compn Lab, Cambridge, Mass; located there / Gp EDc Ls 1q

Hughes Airborne Control Computer / Hughes Res &

Dev Labs, Culver City, Calif / GSp EDc Ms ?q

Hurricane Computer -- SEE: Raydac

IAS Computer -- SEE: Inst for Advanced Study Computer

IBM Automatic Sequence Controlled Calculator, or Harvard Mark I / International Business Machines Corp, Endicott, N Y, and Harvard Univ, Cambridge/ located at Harvard Compn Lab, Cambridge, Mass / Gp RDc Ls lq

IBM Card Programmed Calculator / International Business Machines Corp, New York, N Y / Gp EDc Ms Lq

IBM SSEC (Selective Sequence Electronic Calculator) / International Business Machines Corp, New York, N Y / Gp EDc Ls Oq (dismantled)

IBM 604 (Electronic Calculating Punch) / International Business Machines Corp, New York / Gp EDc Ss Lq

IBM 650 (IBM Magnetic Drum Calculator) / International Business Machines Corp, New York / Gp EDc Ms Sq

IBM 701 (Electronic Data Processing Machine for Scientific Purposes) / International Business Machines Corp, New York / Gp EDc Ls Mq

IBM 702 (Electronic Data Processing Machine for Business Purposes) / International Business Machines Corp, New York / Gp EDc Ls Sq

Icce / - / referred to in "Report on the Work of the Computer Group" by K. D. Tocher, published in London, 1952

IDA Electronic Slide Rule / Computer Corp of America, N Y / Gp EAc ?s ?q

Illiac (Univ of Illinois Automatic Computer) / Univ of Illinois, Urbana, Ill; located there / Gp EDc Ls lq

Institut Blaise Pascal Computer / - / referred to in a report by L. Couffignal in the "Proceedings of a Second Symposium", edited by H H Aiken, Harvard University Press, 1951, p. 374

Institute for Advanced Study Computer / Inst for Advanced Study, Princeton, N.J; located there / Gp EDc Ls lq

Jaincomp A, B, Bl / Jacobs Instrument Co, Bethesda, Md / Sp EDc Ss Sq

Jaincomp-D / Jacobs Instrument Co., Bethesda, Md / Sp EDc Ss Sq

Johniac / - / referred to in footnote 7 in "Computing Bit by Bit" by A L Samuel in "Proc IRE", Oct 1953, p. 1225; probably means any computer based on the Inst for Advanced Study Computer designed under John von Neumann

Junior Johniac -- SEE Rand Junior Johnniac

Kalin-Burkhart Logical Truth Calculator / T A Kalin & W Burkhart, Cambridge, Mass; located at Monrobot Corp, Morris Plains, N J / Sp Rc Ss lq

Leo / - / referred to in report by J M M Pinkerton in "Electronic Engrg" vol 23 (1951), p 142

Logistics Computer / Engineering Res Assoc Div, Remington Rand, St Paul; located at Logistics Research Project, George Washington Univ, Washington, D C / Sp EDc Ls lq

Lorpgac / - / mentioned in footnote 7 in "Computing Bit by Bit" A L Samuel , in "Proc IRE", Oct 1953, p 1225

Los Alamos Computer / Los Alamos Lab, New Mexico; located there / Gp EDc Ls lq

Madam / - / referred to in report by F C Williams and others, in "Proc Instn of Elec Engrs", vol 98 (1951), p 13

Maddida (Magnetic Drum Digital Differential Analyzer) / Bendix Computer Div, Los Angeles, Calif / Gp EDAc Ms Sq

Manchester Computer / Univ of Manchester, England; located there / Gp EDc Ls lq

Maniac -- SEE Institute for Advanced Study Computer

Midac (Michigan Digital Automatic Computer) / Willow Run Res Cr, Univ of Michigan, Ypsilanti, Mich; located there / Gp EDc Ls lq

Miniac / Marchant Research Inc, Oakland, Calif / Gp EDc Ss Oq

Monrobot (V, MU, etc) / Monrobot Corp, Morris Plains, N J / Gp EDc Ls Mq

Mosaic / - / mentioned in "Automatic Digital Computers" by A D Booth and K H V Booth, published by Butterworth Scientific Publns, London, 1953, p 221

MSAC (Moore School Automatic Computer) / Moore School of Electrical Engrg, Univ of Pa, Phila, Pa; located there / Gp EDc Ls Oq

Narec (Naval Research Laboratory Computer) / Naval Res Lab, Washington, D C; located there / Gp EDc Ls lq

NBS Computer -- SEE: Seac

Network Analyzer -- AC / General Electric Co, Schenectady; located there / Gp EAc Ls lq

Network Analyzer -- AC / Westinghouse Electric Co, Pittsburgh; located there / Gp EAc Ls lq

Network Analyzer -- DC / General Electric Co, Schenectady; located there / Gp EAc Ls lq

Network Analyzer -- DC / Westinghouse Electric Co, Pittsburgh; located there / Gp EAc Ls lq

Nicholas (Nickel Delay-Line Storage Computer) / Elliott Brothers Res Labs, Borehamwood, Herts, England; located there / Gp EDc Ss lq

Oarac / General Electric Co, Syracuse, N Y; located at U S Air Force, Aeronautical Research Lab, Wright-Patterson Air Force Base, Dayton, Ohio / Gp EDc Ms lq

Omibac / - / referred to in report by B R Lester in "Proceedings of a Second Symposium", edited by H H Aiken, published by Harvard Univ Press, Cambridge, Mass, 1951

ONR Relay Computer (Office of Naval Research) / Logistics Res Project, George Washington Univ, Washington; located there / Gp RDc Ms lq

Oracle (Oak Ridge Automatic Computer & Logical Engine) / Argonne Natl Lab, Chicago; located at Oak Ridge Natl Lab, Oak Ridge, Tenn / Gp EDc Ls lq

Ordvac / Univ of Illinois, Urbana, Ill; located at Ballistic Research Labs, Aberdeen Proving Ground, Aberdeen, Md / Gp EDc Ls lq

Philbrick Computer / G A Philbrick Res, Inc, Boston/ Gp EAc Ms Lq

Rand Computer / Rand Corp, Santa Monica, Calif; located there / Gp EDc Ls lq

Rand Junior Johnniac / Rand Corp, Santa Monica, Calif; located there / Sp EDc Ss lq

Rascal (Royal Air Force Sequence Controlled Calculator) / - / mentioned in "Automatic Digital Computers" by A D Booth and K H V Booth published by Butterworths Scientific Publns, Lon-

(continued on page 26)

MONROBOT ELECTRONIC CALCULATOR

The MONROBOT is a general purpose digital computer, compact, ruggedized, reliable and reasonably priced. In the MONROBOT, decimal numbers are used. Since twenty digits are available, with a centrally located decimal point, there is no need for scaling or setting of decimal point. Neither overflow nor translation techniques are necessary. Orders are written for the calculator in virtually their original algebraic form.

Neither highly trained personnel nor extensive training effort are needed for the MONROBOT. Keyboard and automatic tape operations are counterparts of the simple programming procedures. Average office personnel become familiar with MONROBOT operation the first day. It prints out results on 8-1/2" wide paper roll, or perforates a paper tape as desired.

MONROBOT V is complete in one desk-size unit, ready to plug in and perform. MONROBOTS can be supplied with capacities to suit special requirements, avoiding excess investment for unnecessary facilities.

MONROBOT CORPORATION

MORRIS PLAINS **NEW JERSEY**

A SUBSIDIARY OF MONROE CALCULATING MACHINE COMPANY

Forum:

GLOSSARY -- CONTRIBUTIONS

I. From D. R. Clutterham, Fort Worth, Tex.:

"Computers and Automation" is doing a service in maintaining a glossary of computer terminology. As long as it continues to keep it informal, up to date, and includes all the meanings of any single term which are known to be in use, the service will be very useful.

The March 1954 issue of "Computers and Automation" asks for definitions of several terms. Perhaps I can throw some light on a couple of these.

The post-mortem diagnosis has been described by Wilkes, Wheeler, and Gill in "The Preparation of Programs for an Electronic Digital Computer" as: "One such method (the post mortem diagnosis method of finding program errors) is to wait until the machine has stopped (or to stop it deliberately) and then, without clearing the whole store, to insert (by pressing the starter button again) a small program which will print, in suitable form the contents of part of the store." Thus the post-mortem diagnosis is a static test used after an unchecked program has "died" on the computer. The data printed by the post-mortem may vary from the entire contents of the memory to simply the quantities which changed since the program was placed in the memory.

The leapfrog test is a test on machine operation which may check as many arithmetic or logical operations for a particular computer as desired. Its characteristic property is that when it has performed the arithmetic check it transfers itself to another portion of the store, checks to see that it has been properly transferred, then begins the arithmetic check all over again. Eventually the checking program will have occupied every possible position in the store and will begin again. The "leapfrog" term itself comes from the apparent jump in the position of the checking routine as seen on a monitoring cathode ray tube as it transfers itself in the store. At the University of Illinois, where I believe the term originated during construction of the ORDVAC, the arithmetic tests are performed on pseudo random numbers which are generated at every "leap" of the program and a test of the input-output mechanisms is included.

Some additional terms which I do not believe you have included yet are:

(continued on page 24)

Forum:

THE ELECTRONIC JUGGLER OF REEVES INSTRUMENT CORP.

At the March, 1954 meeting of the Institute of Radio Engineers in New York, an exhibit which drew much attention from men interested in computers and automation was "The Electronic Juggler", built and shown by Reeves Instrument Corp., New York.

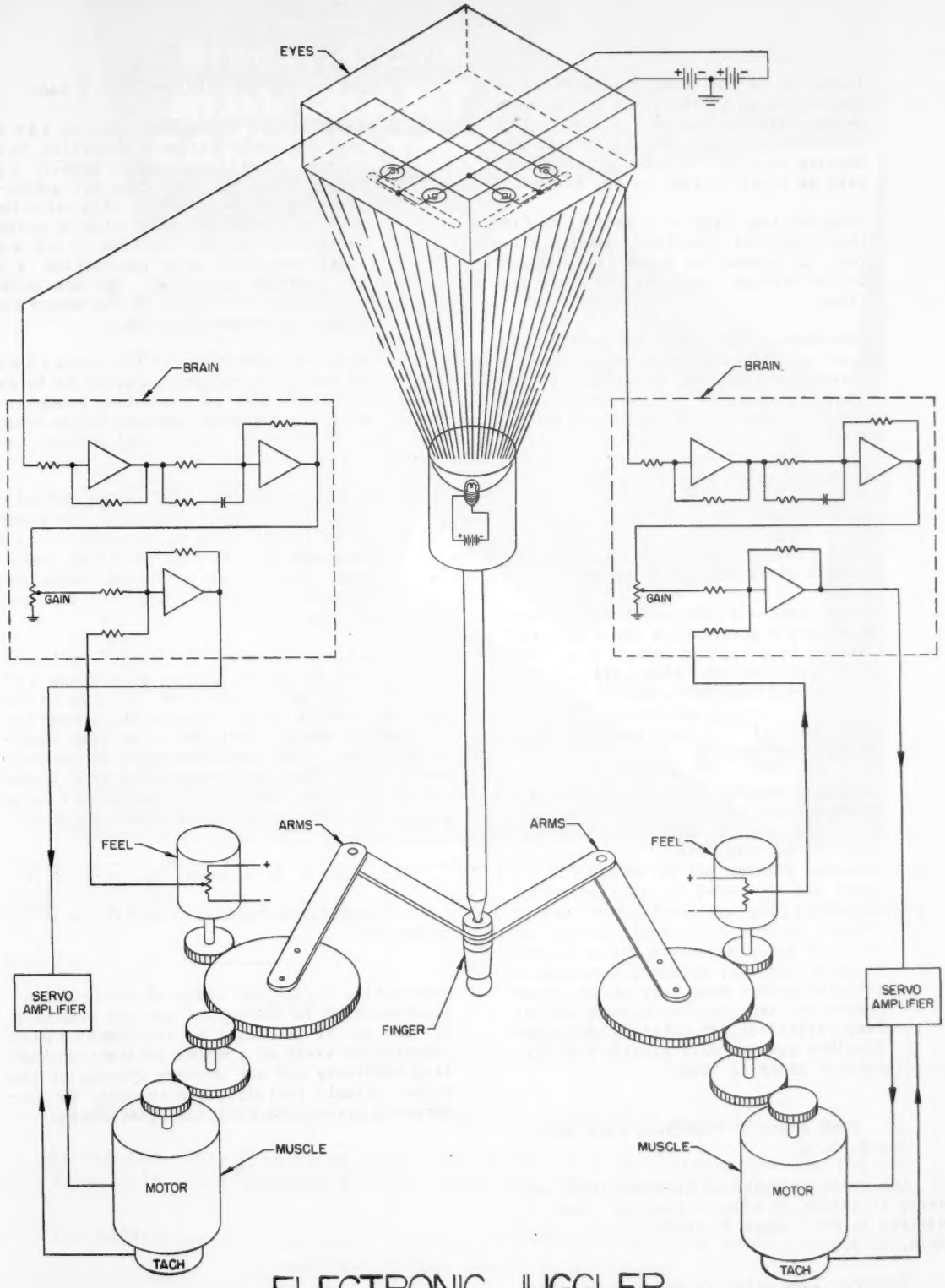
Anybody who has balanced a baseball bat or a broom stick up in the air on the end of his finger knows what the Electronic Juggler's problem is: to move the base of the stick in an appropriate direction and fast enough so as to counteract the tendency of the stick to fall over. For a human being, this is a problem in nice perception and action. It is also a good problem for a computer, of the analog type, fast enough to solve a problem in "real time", and equipped with appropriate "acting" devices.

Charles Whaley and Sidney Godet of Reeves Instrument Corp. solved the problem, using the general scheme as shown in the accompanying illustration. The area marked "brain" refers to the computing section, a REAC computer. Some notes on the mathematical equations and methods they used will be published shortly in "Electronics". Their Electronic Juggler as a two-dimensional stick-balancing machine succeeds and improves upon a one-dimensional stick-balancing machine which Claude Shannon of Bell Telephone Laboratories constructed and demonstrated about four years ago.

The general scheme of the Reeves' Electronic Juggler is: take a three foot long stick; mount a flashlight with batteries in the top of the stick; support the bottom of the stick in a cup that can be moved here and there over a surface by two arms; above the stick in the "ceiling" arrange photocells to detect the movement of the light in the top of the stick and furnish signals of errors; and give the error signals to a system of computer and motors so as to control the base of the stick.

This kind of device is a vivid and dramatic illustration of the powers of computers and robots. As such, it does a useful job in changing people's minds.

-END-



ELECTRONIC JUGGLER

bootstrap -- the coded instructions at the beginning of the input medium together with the one or two instructions which are inserted "manually" into the machine in order to put a routine -- even an input routine -- into a computer

crippled leap frog -- a variation of the leap frog test described, disabled so that it repeats its tests from a single set of storage locations and does not "leap"

interlude -- the input and execution of a set of instructions which are subsequently written over by the input of another portion of the program (e.g., a special input routine for reading in a matrix and placing its elements which is no longer of use when a program operates upon the stored matrix)

order -- syn: instruction

order code -- the set of instructions which a given machine can execute

order type -- a classification of orders into a group which the computer handles in a similar manner (e.g., "add" type might include "clear add", "hold add", "hold subtract", etc.)

order variant -- a particular member of an order type

sequence checking routine -- this is a dynamic checking routine which monitors every instruction which is executed, printing certain data. A sequence checking routine may be designed to print out the coded instruction with addresses, and the contents of each of several registers for each instruction as it is executed, or it may be designed to print out only selected data such as transfer orders when they occur, or store orders and the quantity actually stored. Many variations are possible and a good flexible routine will provide for several of these in itself.

II. From James A. Pederson, Fort Monmouth, N. J.:

Due to an unfortunate incident it is necessary to change my address from Mr. James A. Pederson to Pvt. James A. Pederson, Fort Monmouth, N. J.

However, I am still in the computer business -- and working on the Dyseac.

Here are the definitions that I know:

leapfrog test -- a test routine that performs every internal operation in or on each memory location -- usually by taking a program that does all operations on one location -- then allow the machine to modify the routine to operate on the next higher location -- some fancy tests also move the routine up one location each time. The test makes a very complete check of the memory and memory selection circuits

relative addressing -- the technique of making an address referred to by an order relative to a counter; example:- an order specifies address N, the counter contains K. The actual address referred to is (N+K)

available machine time -- (my definition) time that a machine has the power on -- is not under maintenance -- and is known (?) to be in operating condition. This definition then leaves undefined the phrase ("operating condition")

I believe the word "interlace" is incorrectly used in the definition of minimum access programming. "Interlace" as used in ERA machines refers to the process which enables successive memory locations to be some (multiple of two) time locations apart on the magnetic drum. This is accomplished by a permutation of leads from the angular position counter to the address coincidence detector.

III. From D. R. Klusman, New York, N. Y.:

I would like to have a definition of "cybernetics".

---

cybernetics -- (1) the study of control and communication in the animal and the machine; (2) the art of the pilot or steersman; (3) the comparative study of complex information-handling machinery and the nervous systems of the higher animals including man in order to understand better the functioning of brains.

-END-

RAYTHEON

Binary-Octal
MARCHANT
CALCULATOR

A ten-bank, automatic calculator designed for engineers, mathematicians and operators who test, maintain or program for, electronic digital computers. Adds, subtracts, multiplies, and divides in binary and octal number systems, and performs binary to decimal and decimal to binary conversions.

Write for Bulletin DL-Y-1
TECHNICAL SALES DEPARTMENT

RAYTHEON
MANUFACTURING COMPANY
WALTHAM, MASSACHUSETTS

OTHER BULLETINS
Magnetic Recording Heads DL-Y-2
Magnetic Shift Register DL-Y-3
Computing Services DL-Y-4
Tape Handling Mechanisms DL-Y-5
Write for Them

DO YOU HAVE A TAPE FILING PROBLEM?

no more

boxes

hooks

envelopes

VISIrecord files tapes neatly, visibly -- instantly available for use.

At the AMA Data Processing Conference in New York on February 25, 26, the most frequently asked question from the floor was "How do you file tape efficiently?"

Let VISIrecord show you how. Chrysler, Lincoln-Mercury, and others are using our new tape filing panels to advantage.

VISIrecord, INC., 54 RAILROAD AVE., COPIAGUE, L.I. NEW YORK -- MURRY HILL 6-1990

(continued from page 20)

don, 1953, p 221

Raydac (Raytheon Digital Computer) / Raytheon Mfg Co, Waltham, Mass; located at Naval Air Missile Test Center, Pt Mugu, Calif / Gp EDc Ls 1q

Reac 200, 300 / Reeves Instrument Co, New York / Gp EAc Ls, Ms Lq

Remington-Rand 409 Computer / Remington Rand, New York / Gp EDc Ss ?q

Remington Rand 1101, 1103 -- SEE: ERA 1101, 1103

R-PAC (Recorder Playback Automatic Computer)/Penn State College, State College, Pa; located there/ Sp EAc Ss 1q

Seac (Standards Eastern Automatic Computer) / National Bureau of Standards, Washington, D C; located there / Gp EDc Ls 1q

Sec (Simple Electronic Computer) / Birkbeck College, Univ of London, London, England /located there / Sp EDc Ss ?q

S-FAC (Structure Factor Analog Computer) / Penn State College, State College, Pa; located there/ Sp EAc Ss 1q

Simon / Edmund C Berkeley and Assoc, New York, and others / Sp RDc Ss 3q

Spec (Special Purpose Electronic Computer) or USAF-Fairchild Computer / NEPA Project, Fairchild Engine and Airplane Co, Oak Ridge, Tenn / Sp EDc Ms Oq (dismantled)

Statac (Statistical Automatic Computer) / National Bureau of Standards, Washington, D C; located there / Sp Dc ?s 1q

Swac (Standards Western Automatic Computer) / National Bureau of Standards, Los Angeles, Calif; located there / Gp EDc Ls 1q

TC-1 / International Telemeter Corp, Los Angeles, Calif / Gp EDc Ls Oq

TRE Computer / - / referred to in reports by R H A Carter, A Tutchings, and A M Uttley in "Report on a Conference on High Speed Automatic Calculating Machines", edited by M V Wilkes, published in Cambridge, England, 1950

Typhoon Computer / Radio Corporation of America, Princeton Laboratories, N J ; located ? / Gp EAc Ls 1q

Univac / Eckert-Mauchly Div, Remington Rand, Inc, Phila, Pa / Gp EDc Ls Mq

Utec (Univ of Toronto Electronic Computer) / McLellan Lab, Univ of Toronto, Toronto, Canada; located there / Sp EDc Ss 1q

Whirlwind I / Digital Computer Lab, Mass Inst of Tech, Cambridge 39, Mass; located there / Sp EDc Ls 1q

Wisc / - / mentioned in footnote 7 in "Computing Bit by Bit" by A L Samuel, in "Proc IRE" Oct 1953, p 1225

X-RAC (x-ray analog computer) / Penn State College, State College, Pa; located there / Sp EAc Ms 1q

Zuse Model IV / Konrad Zuse, Neukirchen, Germany; located at Swiss Federal Inst of Tech, Zurich, Switzerland / Gp RDc Ls 1q

-END-

FXC first in ferrites...

FERROXCUBE CORE MATERIALS ARE FINDING SUCCESSFUL APPLICATION IN MEMORY CIRCUITS REQUIRING RECTANGULAR HYSTERESIS LOOP TOROIDS, IN BLOCKING OSCILLATOR CIRCUITS, IN PULSE TRANSFORMERS, IN DELAY LINES AND IN RECORDING HEADS

MAY WE SEND YOU APPLICATION DATA IN YOUR PARTICULAR FIELD OF INTEREST?

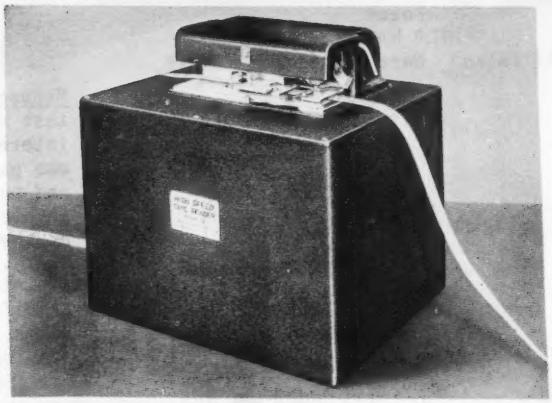
FERROXCUBE CORPORATION OF AMERICA

• A Joint Affiliate of Sprague Electric Co. and Philips Industries, Managed by Sprague •

SAUGERTIES, NEW YORK

In Canada: Rogers Majestic Electronics Limited, 11-19 Brentcliffe Road, Leaside, Toronto 17.

FERRANTI
HIGH SPEED TAPE READER

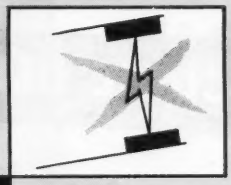


FAST Tape is read at speeds up to 200 characters per second. The tape can be stopped from full speed within .03 inch, and can be accelerated from rest to full speed in 5 mili seconds.

VERSATILE A simple lever adjustment adapts the Reader for either 5 hole or 7 hole tape.

SIMPLE The tape is easily inserted and the friction drive takes splices without difficulty. A tape may be passed through the reader thousands of times without appreciable wear.

FERRANTI ELECTRIC, INC. 30 Rockefeller Plaza, New York 20, N. Y.



Defeat your "Arc Enemy" with

CONTACT PROTECTORS

A unique application of SELENIUM RECTIFIERS developed by

Federal

TO PUT AN END TO ARCING CONTACTS

Contact Protectors by *Federal* are a *sure* way to economy and longer life for relay contacts . . . to eliminate circuit failure and interference caused by arcing.

Now you can throw away your slide rule! . . . Select the Contact Protector for *your* application from Federal's extensive list.

Designed for use in AC or DC circuits . . . small in size . . . with pigtail leads for easy mounting. For full information, write to Federal, Dept. F-122

Federal Telephone and Radio Company

SELENIUM-INTELIN DEPARTMENT

100 Kingsland Road **Clifton, N. J.**

Forum:
HELP WANTED
From Bill Danch, North Hollywood, Calif.

Manuscripts. We desire to publish articles that are factual, useful, understandable, and interesting to many kinds of people engaged in one part or another of the field of computers and automation. In this audience are many people who have expert knowledge of some part of the field, but who are laymen in other parts of it. Consequently, a writer should seek to explain his subject, and show its context and significance. He should define unfamiliar terms, or use them in a way that makes their meaning unmistakable. He should identify unfamiliar persons with a few words. He should use examples, comparisons, analogies, etc., whenever they may help readers to understand a difficult point. He should give data supporting his argument and evidence for his assertions. An article may certainly be controversial if the subject is discussed reasonably. Ordinarily, the length should be 1000 to 4000 words, and payment will be $10 to $50 on publication. A suggestion for an article should be submitted to us before too much work is done. To be considered for any particular issue, the manuscript should be in our hands by the 5th of the preceding month.

andersen SOLID ULTRA-SONIC DELAY LINES

Andersen solid ultra-sonic delay lines offer proven advantages for pulse storage in digital computers and electronic brains. Size and weight are extremely small. A 400 microsecond line weighs only 1¼ pounds.

DELAY TIMES: 0.6 to 1000 microseconds and higher.

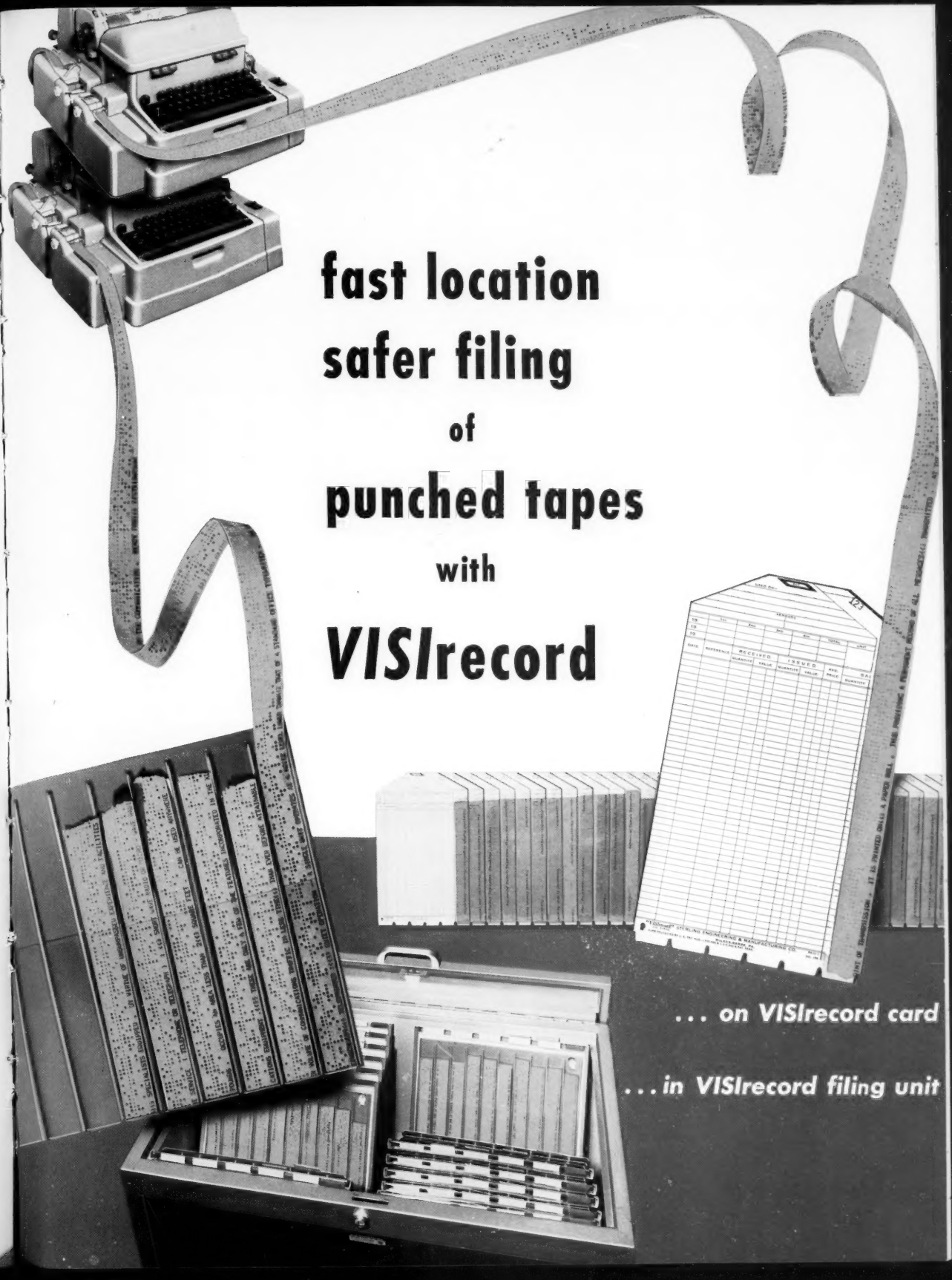
OPERATING TEMPERATURE: -55 to 90° C. Note: Certain types have been repetitively cycled in operation over -55° to +200° C. For extreme accuracy lines may be supplied with thermostatically controlled cases.

INSERTION LOSS: Limited to 26 to 60 d.b.

Specialists in ultra-sonic research and design since 1946.

andersen Laboratories
INCORPORATED

39-C TALCOTT ROAD
WEST HARTFORD 10, CONN. Phone ADams 3-4491

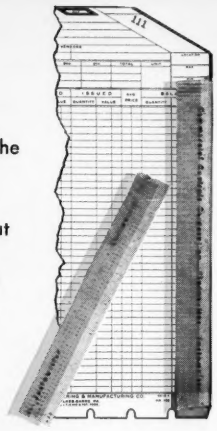

fast location
safer filing
of
punched tapes
with
VISIrecord
. . . on VISIrecord card
. . . in VISIrecord filing unit

no more

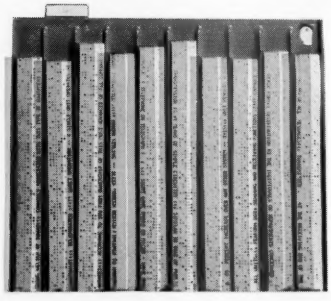
BOXES, HOOKS OR ENVELOPES!

***VISI*record files tapes neatly, visibly . . . ready for instant use.**

Whether you use tape ⅜" or 1" wide, there is a *VISI*record 10-compartment tape panel to fit your needs. These panels are designed for filing in a *VISI*record unit. For filing tapes directly on the *VISI*record card, a clear plastic envelope channel is easily attached by means of duotape affixed to the back of the channel. In this case, channel widths are 1" and 1⅛".



TAPE-HOLDER attaches permanently to the *VISI*record card. Punched-tape pertaining to that record actually becomes part of the record itself, immediately available!



TAPE-PANEL has ten pockets for tapes, is filed in a *VISI*record housing unit. Indexing and visibility make tapes easy to locate, keeps them neat and clean.

***VISI*record** Tape-Filing is already in use by such organizations as Chrysler Corporation and Lincoln-Mercury, for Purchase Orders and Inspection Reports.

Well Table and Porta Tray

LT1 Junior Posting Tray

FUNCTIONAL HOUSING EQUIPMENT FOR PUNCHED-TAPE FILING

Huge Capacities—10,000 or more tapes filed with VISIrecord cards are immediately accessible to one operator in a seated position.

LT2 Posting Tray

LTX Senior Posting Tray

LTD4 Double Posting Desk

VISIrecord, Inc. COPIAGUE, L. I., NEW YORK • In Canada: 266 King Street West, Toronto 1, Ontario

PATENTS

Hans Schroeder
Milwaukee, Wisconsin

The following is a compilation of patents pertaining to computers and associated equipment from the Official Gazette of the United States Patent Office, dates of issue as indicated. Each entry consists of: patent number / inventor(s) / assignee / invention.

March 23, 1954: 2,673,030 / S G Isserstedt, Toronto, Ont / - / Analog computer for multiplication by logarithmic input variation.

2,673,031 / R G Piety, Bartlesville, Okla. / Phillips Petroleum Co, Inc / Apparatus for simulating a pumping system.

2,673,032 / H P Luhn, Armonk, N Y / IBM Corp., New York, N Y / Data storage, read-out and comparison device.

2,673,337 / R W Avery, Clifton Hgts, Pa / Burroughs Adding Machine Co / Amplifier system utilizing saturable magnetic elements.

March 30, 1954: 2,673,683 / M tenBosch, White Plains, and C F. Schaefer, Port Washington, N Y / Norden Labs Corp, White Plains, N Y / Mechanical analog computer for finding the time of fall of a projectile.

2,673,936 / J R Harris, Dover, N J / Bell Tel Labs, Inc., New York, N Y / Electronic gating circuit using a plurality of diodes.

2,673,951 / P L G Morel, Paris, France / Société d'Electronique et d'Automatisme, Paris France / Servomechanism for tracing and recopying a model.

April 6, 1954: 2,674,409 / E Lakatos, Cranford N J / Bell Tel Labs, Inc, New York, N Y / Electrical network producing a voltage representing a function of two factors.

2,674,707 / E G DeMott, Elizabeth N J / Weston Electrical Instrument Corp, Newark, N J / Servomechanism damping system using relays.

2,674,708 / H L Husted, Minneapolis, Minn. / Minneapolis-Honeywell Regulator Co, Minneapolis, Minn / Nonlinear amplifier generating damping signal for servomechanism.

2,674,728 / J T Potter, Great Neck, N Y / - / Magnetic information storage device using a plurality of frames on which medium is supported.

2,674,732 / H M Robbins, Los Angeles, Calif / Hughes Tool Co, Houston, Tex / Delay Network with electronically controlled amount of time delay.

April 13, 1954: 2,675,479 / M G Harker, Pinner, J B Smith, Ealing, London, and P F T C Stilwell, Haddenham, Aylesbury, England / Electric and Musical Industries, Ltd, Hayes, England / Electronic pulse integrating circuit.

2,675,471 / T M Berry, Schenectady, and G R Fawkes, Jr, Scotia, N Y / General Electric Co / Electronic integrating circuit.

April 20, 1954: 2,675,962 / P L Couffignal, Paris, France / Société civiles d'Etudes de Calcul Automatique, Paris, France / Curve-tracing output member for calculating machines.

2,676,251 / A D Scarbrough, Los Angeles, Calif / Hughes Tool Co, Houston, Tex / Bistable blocking oscillator.

2,676,253 / W R Ayres, Oaklyn, N J / RCA / Electronic voltage comparing device

2,676,271 / E G Baldwin, East Orange, N J / Bell Tel Labs, Inc, New York, N Y / Electronic gating circuit using transistor

2,676,286 / R B Buchner, Eindhoven, Netherlands / Hartford Natl Bank and Trust Co, Hartford, Conn (as trustee) / Electronic voltage comparator.

2,676,289 / A H Wulfsberg and H M Schweighofer, Cedar Rapids, Ia / Collins Radio Co, Cedar Rapids, Ia / Shaft positioning mechanism for binary code operation, using relays.

2,676,313 / J W Dehn, Great Neck, N Y / Bell Tel Labs, Inc, New York, N Y / Pulse counter using relays.

April 27, 1954: 2,676,755 / D P Stiff, Fairfield, Ala / US Steel Corp / Binary counter for objects travelling in two channels.

2,676,756 / W Q Gulley, Chester, Va / US Atomic Energy Comm / Binary scaling circuit.

2,676,770 / O H Schuck, Minneapolis, Minn / Minneapolis-Honeywell Regulator Co, Minneapolis, Minn / Automatic crab angle removal apparatus for aircraft.

2,677,074 / P J Reuter, Kew Gardens, N Y / Remington Rand Inc, N Y, N Y / Counter using a gas tube with a plurality of cathodes and an equal number of anodes.

2,677,086 / C H McAdie, Balto, Md / Westinghouse Elec Corp, East Pittsburgh, Pa / Circuit for phase-sensitive servo amplifiers.

May 4, 1954: 2,677,513 / W H Kliever, Minneapolis, Minn / Minneapolis-Honeywell Regulator Co, Minneapolis, Minn / Servo to control attack angle of an aircraft.

2,677,729 / W H Mayne, San Antonio, Tex / O S Petty, San Antonio, Tex / Dual triode differential amplifier.

May 11, 1954: 2,678,163 / R B Roberts, Washington, D C, and E H Smith, Silver Spring, Md / one fourth to: J O Evans, Jr, Washington, D C / Computing and predicting device.

2,678,177 / P J Chenery, Pelham Heights, NY / Sperry Corp / Manual booster and automatic pilot servo system.

2,678,178 / A M MacCallum, Maywood, N J / Bendix Aviation Corp, Teterboro, N J / Servo system for altitude control of aircraft.

-END-

Automatic Electronic Equipment for

READING

Printed or Typewritten Characters
and converting them into coded electrical impulses

INTELLIGENT MACHINES RESEARCH CORP.

1101 Lee Highway, Arlington, Va. JAckson 5-6400

REPLY FORMS: Who's Who Entry; Reader's Inquiry

Paste label on envelope:↓ Enclose form in evelope:↓

BUSINESS REPLY LABEL
NO POSTAGE STAMP NECESSARY IF MAILED IN THE UNITED STATES

4¢ Postage Will Be Paid By —

EDMUND C. BERKELEY AND ASSOCIATES
36 West 11th Street
New York 11, N. Y.

FIRST CLASS
PERMIT NO 1680
Sec. 34.9, P. L. & R.
NEW YORK, N. Y.

IDENTIFICATION

Name (please print).....
Address.....
Organization (& address)?.....
Title?.....

Please fill in completely

WHO'S WHO ENTRY FORM

Year of Birth?.....

MAIN INTERESTS:
( ) Design
( ) Construction
( ) Applications
( ) Sales
( ) Electronics
( ) Mathematics
( ) Business
( ) Programming
( ) Other (specify):
.....
.....

College or last school?.....

Year of entering the computing machinery field?.....

Occupation?..... (Enclose more information about yourself if you wish — it will help in your listing.)

READER'S INQUIRY FORM

Please send me additional information on the following subjects for which I have circled the CA number:

1	2	3	4	5	26	27	28	29	30	51	52	53	54	55	76	77	78	79	80	101	102	103	104	105	126	127	128	129	130
6	7	8	9	10	31	32	33	34	35	56	57	58	59	60	81	82	83	84	85	106	107	108	109	110	131	132	133	134	135
11	12	13	14	15	36	37	38	39	40	61	62	63	64	65	86	87	88	89	90	111	112	113	114	115	136	137	138	139	140
16	17	18	19	20	41	42	43	44	45	66	67	68	69	70	91	92	93	94	95	116	117	118	119	120	141	142	143	144	145
21	22	23	24	25	46	47	48	49	50	71	72	73	74	75	96	97	98	99	100	121	122	123	124	125	146	147	148	149	150

ROSTER OF AUTOMATIC COMPUTING SERVICES

(Supplement, information as of June 3, 1954)

The purpose of this roster is to report organizations (all that are known to us) offering automatic computing services and having at least one automatic computer. Each roster entry contains: name of the organization, its address / analog or digital computation provided/ notes on equipment / any restrictions as to clients.

This edition is a supplement to the cumulative edition published in the February, 1954 issue of "Computers and Automation", vol. 3, no. 2, and the supplements in the April and May, 1954 issues, vol. 3, no. 4 and 5.

We shall be grateful for any additions or corrections that any reader is able to send us.

Some of the abbreviations are: A, analog ; D, digital.

Armour Research Foundation of Illinois Inst of Techn, 10 West 35 St, Chicago 16, Ill / A, D / Goodyear Electronic Differential Analyzers, Two Channel Electronic Function Generator,IBM card programmed calculator / unrestricted

Forum:

EMPLOYMENT OPPORTUNITY

From R. O. Ferguson, Methods Engineering Council, Management Consultants, 718 Wallace Ave., Pittsburgh 21, Pa.:

We have subscribed to your publication, Computers and Automation, for some time now. Perhaps you might know of or come in contact with individuals seeking positions in Operations Research activities. At the present time we are expanding our staff in this field and have openings for a Staff Mathematician and a Staff Consultant to work with us in our Linear Programming Installations.

If you know of anyone interested in positions of this nature, we would appreciate your referring them to us.

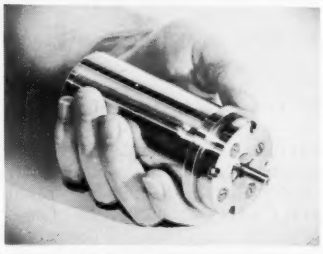
ROSTER OF ORGANIZATIONS
(continued from page 9)

tions -- travel reservations, flight data processing, stock market quotations, etc. Magnetronic Reservisor, in use at American Airlines reservations center. Magnetronic stock quotation system now in use in Toronto Stock Exchange. Associated with Western Union. Ms (275) Me(1928) DIc RMSa

Visi-Record, Inc., Copiague, L. I., N. Y. / Amityville 4-4900 *A

Filing systems for punched paper tape , etc. Ms(100) Ic RMSa

-END-



★ INSTANTANEOUS ANALOG TO DIGITAL CONVERSION

★ DIRECT COUPLING ELIMINATES SERVO

★ ACCURACY INDEPENDENT OF SHAFT ACCELERATION

★ SELF CALIBRATING

★ NO ADJUSTMENT

★ RESOLUTION TO 1 PART IN 5000

★ SIZE 23 SYNCHRO MOUNT

★ 4⅝" LONG BY 2" DIA.

★ UNDER THREE POUNDS

announcing the

SHAFT POSITION QUANTIZER

An induction device with no gears or digitizing commutators. It may be coupled to any rotating shaft. An external command pulse initiates a reading. A count of the output pulse train from the Control Unit, which may be remote from the Quantizer, is an exact measure of the shaft position at the instant of the command pulse. The count may be taken by a wide variety of Austin or other memory or counting devices.

Samplings may be made at any irregular or infrequent time interval initiated by the command pulse source, which may be a simple switch or an accurate timing device. Data is taken at precisely the time of the command pulse at rates up to twenty a second or higher.

The Austin Shaft Position Quantizer will divide a circle into 4000, 3600, 4096, or other equal parts with an accuracy of plus or minus one part. The data shaft may change direction, accelerate, or remain stationary without affecting the accuracy of the reading. No calibration is required.

Austin Engineers are available for special problems in automation systems, computers, and automatic data processing, plotting, and recording.

THE AUSTIN COMPANY SPECIAL DEVICES DIVISION
76 NINTH AVENUE NEW YORK 11, N. Y.

COMPUTERS AND AUTOMATION - Back Copies & Reprints

ARTICLES: October, 1952: Communication and Control in the Computing Machinery Field
The Parameters of Business Problems -- Edmund C. Berkeley
January, 1953: Brains: Electronic and Otherwise -- A. S. Householder
What Computers Do — S. B. Williams
The Parameters of a Business Problem in Reading — C. H. Dent
Automatic Computers on Election Night -- E. F. Murphy and E. C. Berkeley
March: Gypsy, Model VI, Claude Shannon, Nimwit, and the Mouse — George A. W. Boehm,
Water and Computers -- Henry M. Paynter, Jr., Mass. Inst. of Technology, and Neil Macdonald
The Concept of Automation — E. C. Berkeley
The ERA 1103 Automatic Computer --Neil Macdonald
April: The Art of Solving Secret Ciphers, and the Digital Computer -- Fletcher Pratt
Avenues for Future Development in Computing Machinery -- Edmund C. Berkeley
Hungarian Prelude to Automation --Gene J. Hegedus
May: Compiling Routines — Grace M. Hopper, Remington Rand
Mechanical Translation -- Andrew D. Booth, Birkbeck College, London
Medical Diagnosis -- Marshall Stone, University of Chicago
July: Machine Translation -- Y. Bar-Hillel, Mass. Inst. of Technology
Robot Traffic Policemen — George A. W. Boehm,
How to Talk About Computers — Rudolf Flesch, Author of "Art of Plain Talk"
September: The Soviet Union: Automatic Digital Computer Research -- Tommaso Fortuna
Digital Computer Questionnaire -- Lawrence Wainwright
"How to Talk About Computers": Discussion — G. G. Hawley and others
October: Computers in the Factory -- David W. Brown
The Flood of Automatic Computers --Neil Macdonald
The Meeting of the Association for Computing Machinery in Cambridge, Mass., September, 1953 -- E. C. Berkeley
November: Who Will Man the New Digital Computers? -- John W. Carr III
Electronic Equipment Applied to Periodic Billing -- E. F. Cooley
Air-Floating: A New Principle in Magnetic Recording of Information — Glenn E. Hagen
December: How a Central Computing Laboratory Can Help Industry — Richard F. Clippinger
"Combined" Operations in a Life Insurance Company Instead of "Fractured" Operations -- R. T. Wiseman
"Can Machines Think?": Discussion — J.L. Rogers and A. S. Householder
January, 1954: The End of an Epoch: The Joint Computer Conference, Washington, D. C., December, 1953 — Alston S. Householder
Savings and Mortgage Division, American Bankers Association: Report of the Committee on Electronics, September, 1953 — Joseph E. Perry and others
Automation in the Kitchen -- Fletcher Pratt
February: Language Translation by Machine: A Report of the First Successful Trial -- Neil Macdonald
Reflective Thinking in Machines -- Elliot L. Gruenberg
Glossary of Terms in Computers and Automation: Discussion -- Alston S. Householder and E.C. Berkeley
March: Towards More Automation in Petroleum Industries -- Sybil M. Rock
Introducing Computers to Beginners -- Geoffrey Ashe
Subroutines: Prefabricated Blocks for Building -- Margaret H. Harper
Glossaries of Terms: More Discussion -- Nathaniel Rochester, Willis H. Ware, Grace M. Hopper and others
April: Processing Information Using a Common Machine Language: The American Management Association Conference, February, 1954 -- Neil Macdonald
The Concept of Thinking -- Elliot L. Gruenberg
General Purpose Robots -- Lawrence M. Clark
May: Ferrite Memory Devices -- Ephraim Gelbard and William Olander
Flight Simulators -- Alfred Pfanstiehl
Autonomy and Self Repair for Computers -- Elliot L. Gruenberg
A Glossary of Computer Terminology -- Grace M. Hopper.

REFERENCE INFORMATION (in various issues):

Roster of Organizations in the Field of Computers and Automation / Roster of Automatic Computing Services / Roster of Organizations Making Components / List of Automatic Computers / Who's Who in the Field of Computers and Automation / Books and Other Publications/ Glossary / Patents

Price of back copies, if available, $1.25 each.

A subscription (see rates on page 4) may be specified to begin with any issue from May, 1954 , to date.

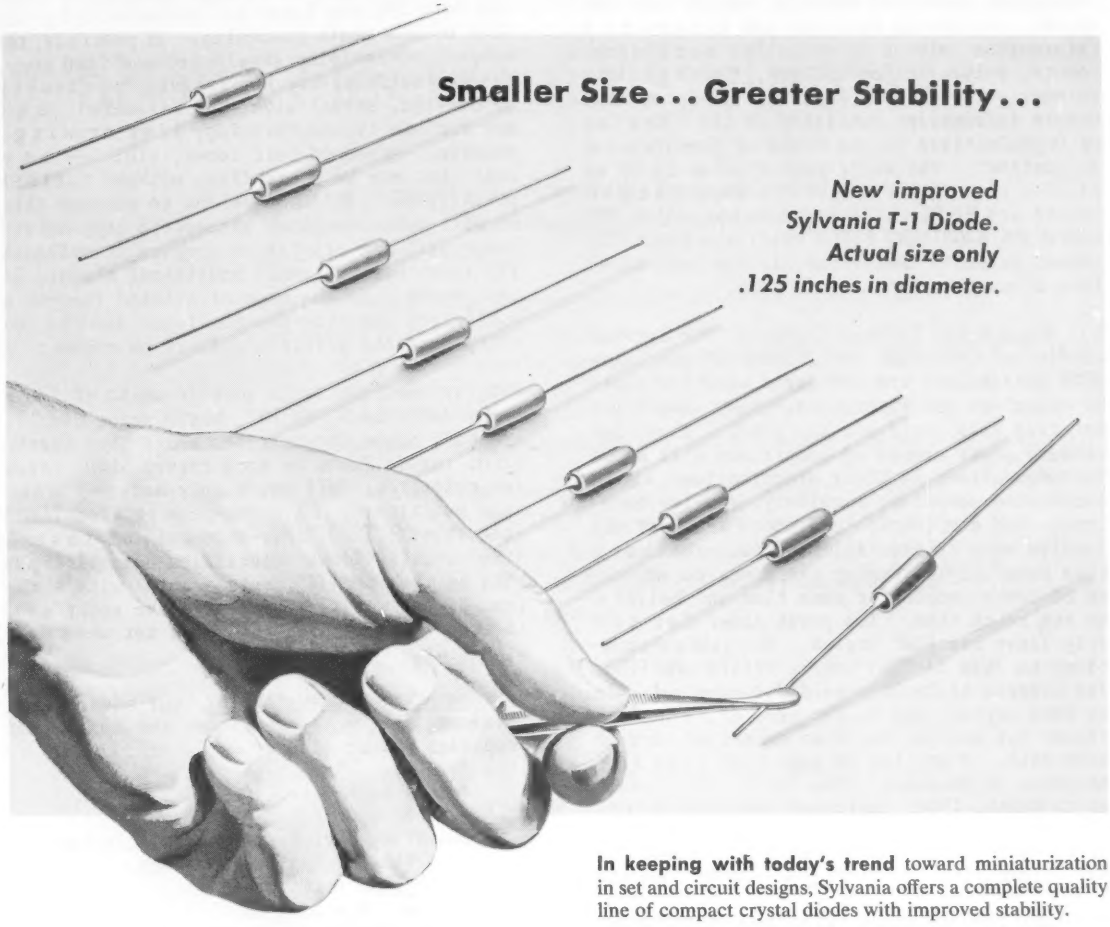
REPRINTS: Index No. 1 (from December issue) -- 20 cents
Glossary of Terms in the Field of Computers and Automation (from three 1953 issues) -- 60 cents

WRITE TO:

Edmund C. Berkeley and Associates
Publishers of COMPUTERS AND AUTOMATION
36 West 11 St., New York 11, N. Y.

Sylvania Offers You . . .

A NEW COMPACT DIODE LINE



In keeping with today's trend toward miniaturization in set and circuit designs, Sylvania offers a complete quality line of compact crystal diodes with improved stability.

These new components measure only .125 inches in diameter . . . require only 1/6th the space of former units. At the same time, due to advanced manufacturing techniques and Sylvania's new automatic precision equipment, they provide far higher performance records.

With these tiny diodes, you can be assured of more uniform characteristics and closer tolerance limits . . . even on large quantity orders.

This new T-1 Series also has recently passed MIL-E-1B moisture-resistance tests. Now available in capacities for every need. For full details write to Dept. 4E-1107, Sylvania today!

Another reason why it pays to specify Sylvania!

SYLVANIA

Sylvania Electric Products Inc., 1740 Broadway, New York 19, N. Y.

In Canada: Sylvania Electric (Canada) Ltd.
University Tower Building, St. Catherine Street, Montreal, P. Q.

LIGHTING • RADIO • ELECTRONICS • TELEVISION

ADVERTISING IN "COMPUTERS AND AUTOMATION"

Memorandum from Edmund C. Berkeley and Associates
Publishers of COMPUTERS AND AUTOMATION
36 West 11 St., New York 11, N.Y.

1. What is "COMPUTERS AND AUTOMATION"? It is a magazine published monthly, except June and August, containing articles and reference information related to computing machinery, robots, automatic controllers, cybernetics, automation, etc. One important piece of reference information published is the "Roster of Organizations in the Field of Computers and Automation". The basic subscription rate is $4.50 a year in the United States. Single copies are $1.25. The magazine was called THE COMPUTING MACHINERY FIELD until the March, 1953 issue; prior to that issue, it was published less often than ten times a year.

2. Who are the logical readers? The logical readers of COMPUTERS AND AUTOMATION are some 4000 persons who are concerned with the field of computers and automation. Many people are entering this field all the time. These include a great number of people who will make recommendations to their organizations about purchasing computing machinery, similar machinery, and components, and whose decisions may involve very substantial figures. We have been carefully gathering the names and addresses of these people for some time and believe we can reach them. The print order for the July issue was 1800 copies. The paid subscriptions on June 3, 1954 were a little over 1150. The overrun is largely held for eventual sale as back copies, and in the case of several issues the overrun has been exhausted through such sale. A mailing to some 2000 nonsubscribers in December, 1953 (with 173 responses up to March, 1954) indicated that two-thirds of them saw the magazine (library, circulation, or friend's copy) and of these two-thirds over 93% "liked it".

3. What type of advertising does COMPUTERS AND AUTOMATION take? The purpose of the magazine is to be factual and to the point. For this purpose the kind of advertising wanted is the kind that answers questions factually. We recommend for the audience that we reach, that advertising be factual, useful, interesting, understandable, and new from issue to issue. We have had a number of comments expressing satisfaction with our style of advertising.

4. What are the specifications and cost of advertising? COMPUTERS AND AUTOMATION is published on pages 8½" x 11" (ad size, 7" by 10") and produced by photooffset, except that printed sheet advertising may be inserted and bound in with the magazine in most cases. The closing date for any issue is approximately the 10th of the month preceding. If possible, the company advertising should produce final copy. For photooffset, the copy should be exactly as desired, actual size, and assembled, and may include typing, writing, line drawing, printing, screened half tones, etc. -- any copy that may be photooffset without further preparation. If inconvenient to produce this, we will take rough or incomplete copy and arrange with our printer to prepare it or finish it; there will be small additional charges in this event. In the case of printed inserts, a sufficient quantity for the issue should be shipped to our printer, address on request.

Display advertising is sold in units of full pages (ad size 7" by 10", basic rate, $130) and half pages (basic rate, $70); back cover, $250; inside front or back cover, $160. Extra for color red (full pages only and only in certain positions), 35%. Two-page printed insert (one sheet), $220; four-page printed insert (two sheets), $400. Classified advertising is sold by the word (40 cents a word) with a minimum of ten words. We reserve the right not to accept advertising that does not meet our standards.

5. Who are our advertisers? Our advertisers in recent issues have included the following companies, among others:

Automatic Electric Co.
Burroughs Corporation
Computing Devices of Canada, Limited
Consolidated Engineering Corp.
Electronic Associates, Inc.
Ferranti Electric Co.
Ferroxcube Corp. of America
General Ceramics Corp.
Hughes Research and Development Lab.
Intelligent Machines Research Corp.
International Business Machines Corp.
Laboratory for Electronics
Logistics Research, Inc.
The Macmillan Co.
Monrobot Corp.
George A. Philbrick Researches, Inc.
Potter Instrument Co.
Raytheon Mfg. Co.
Reeves Instrument Co.
Remington Rand, Inc.
Sprague Electric Co.
Sylvania Electric Products, Inc.
Telecomputing Corp.

To top-level planners

who want to know more about electronic systems:

Here's a practical way to learn the business end of electronic data processing and to evaluate computing systems in the light of your particular requirements.

Let Univac solve a complex data-processing problem for you on a service-fee basis. The more complex the problem, the more impressed you will be by the speed and economy of this world-famous electronic system.

Remington Rand methods engineers will review the entire operation with you and program Univac for maximum efficiency in handling your work.

With substantial savings in time and money, Univac will give you exactly the solution you want. You'll see for yourself what so many firms have proved — that for most volume business operations an electronic system is not only remarkably faster, but far more economical, more flexible, and more accurate than any other method.

We also remind you that your key men can gain an overall knowledge of electronic data processing by attending our regularly-scheduled training courses in electronic methods. The courses stress commercial applications.

For information on the Univac Electronic Computing Center and executive training courses write us on your business letterhead.

Remington Rand INC

Electronic Computer Dept., Room 1770, 315 Fourth Avenue, New York 10.

UNIVAC

ELECTRONIC DATA-PROCESSING SYSTEM

a profit-building business tool, an invaluable aid to long-range planning.

ADVERTISING INDEX - JULY, 1954

The purpose of COMPUTERS AND AUTOMATION is to be factual, useful, and understandable. For this purpose, the kind of advertising we desire to publish is the kind that answers questions, such as, What are your products? What are your services? And for each product, What is it called? What does it do? How well does it work? What are its main specifications? We reserve the right not to accept advertising that does not meet our standards.

Following is the index to advertisements:

CA No.	Advertiser	Subject	Page
66	Andersen Laboratories, Inc.	Solid Ultrasonic Delay Lines	28
51	The Austin Co.	Shaft Position Quantizer	33
52	Computers and Automation	Reply Form Back Copies Advertising	32 34 36
53	Federal Telephone and Radio Co.	Contact Protectors	27
54	Ferranti Electric Co.	Photoelectric Tape Reader	27
55	Ferroxcube Corp. of America	Magnetic Core Materials: Ferrites	26
56	Hughes Research & Develop. Labs.	Employment in Computer Work	39
57	Intelligent Machines Res. Corp.	Electronic Reading of Printed Characters, etc.	32
58	International Business Machines Corp.	Electronic Data Processing Machine	2
59	Ketay Manufacturing Corp.	Magnetic Amplifier Servo Systems	11, 12
60	Monrobot Corp.	Monrobot Computer	21
61	Raytheon Manufacturing Co.	Binary-Octal Calculator	25
62	Remington Rand, Inc.	Univac	37
63	Sprague Electric	Wire-Wound Resistors Pulse Transformers	5 40
64	Sylvania Electric Products, Inc.	Type T-1 Diodes	35
65	VISrecord, Inc.	Punched-Tape Filing	25, 29, 30

If you wish more information about any of the products or services mentioned in one or more of these advertisements, you may circle the appropriate CA No.'s on the Reader's Inquiry Form (see page 32) and send that form to us (we pay postage; see the instructions). We shall then forward your inquiries, and you will hear from the advertisers direct.